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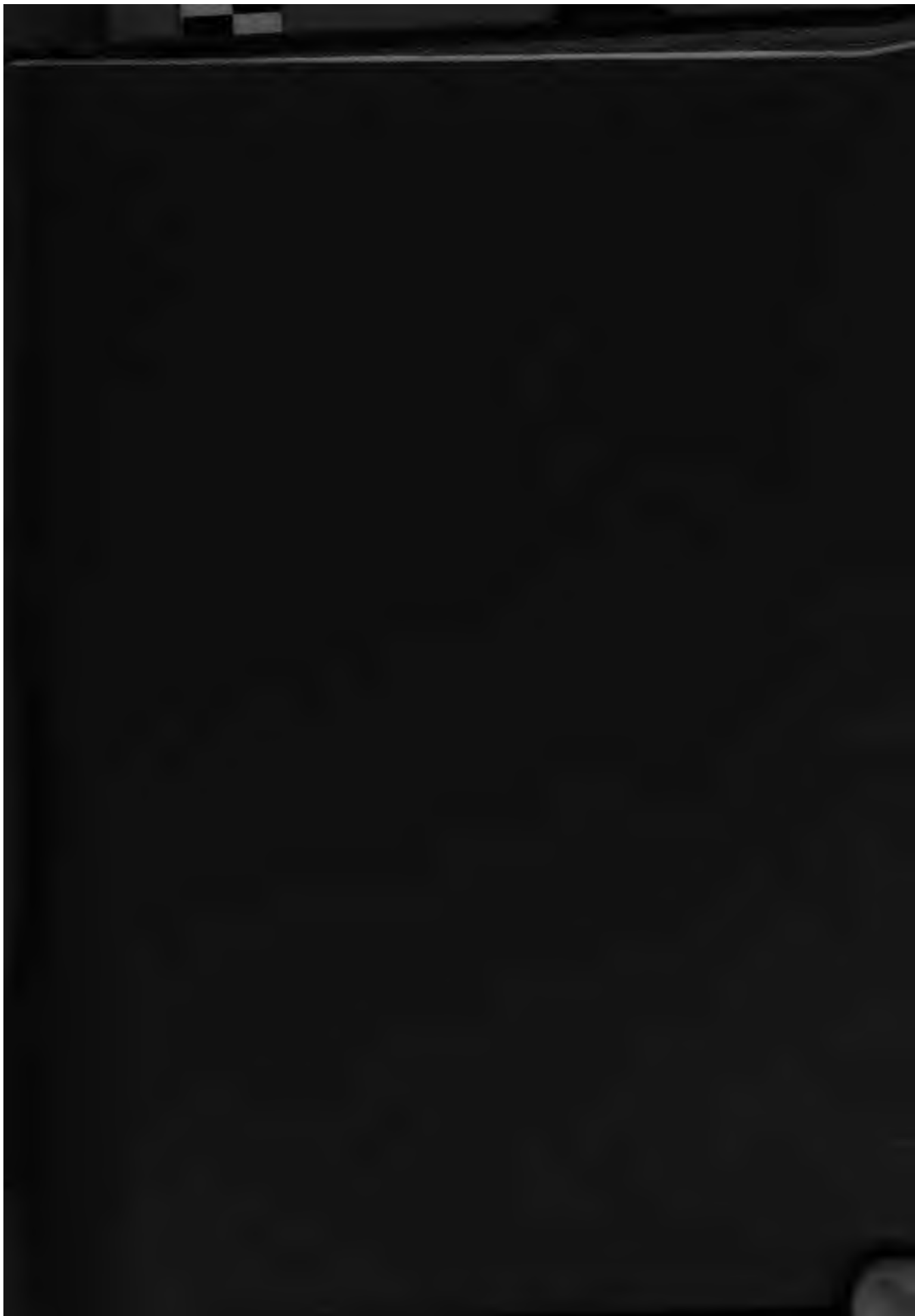
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A TREATISE  
ON  
FUTURE NAVAL BATTLES,  
AND HOW TO FIGHT THEM,  
AND ON  
OTHER NAVAL TACTICAL SUBJECTS.

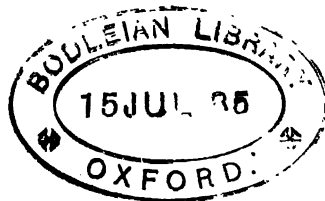
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VICE-ADMIRAL HIS ROYAL HIGHNESS

**THE DUKE OF EDINBURGH, K.G.,**

ETC., ETC.





## PREFACE.

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THE greater part of the contents of this treatise on naval subjects has already appeared in the monthly issues of the *Illustrated Naval and Military Magazine*, but I have been encouraged to republish them in a collective form at the present crisis of naval affairs, because it may be assumed that, *nolens volens*, our Government will be compelled to add greatly to the strength of our naval forces. I would therefore invite my readers not hastily to discard my opinions, but to work out each question of tactical importance, with careful discrimination of what is practically essential to the exigencies of modern warfare, not forgetting that errors of judgment are generally the offspring of prejudice or disinclination to bring each problem as it arises to the test of exhaustive inquiry.

The heterogeneous character of the fleet we possess displays a want of matured thought and the absence of any such defined system of classification as ought to have been formulated and carried out in the reconstruction of the navy of late years, and it is most desirable that the guiding principles to be observed in the future in order to arrive at any sound tactical conclusions on designs for ships of war should be a more strict adherence to those prominent features of efficiency which distinguish each class of ship in view of the special services required to be rendered.

In estimating the value of outside armour it must be borne in mind that whilst the size of ship of each class is regulated by tactical considerations, there is nothing to prevent guns of great power being mounted on vessels of very moderate dimensions, and therefore the problem to be solved is the skilful distribution of a given weight of material in a vessel of limited displacement, consistent with essential properties, and a full recognition of the importance of providing the more weakly-armed vessels with the only means of escaping capture, namely, superior speed. I am aware that a great deal of repetition of the same arguments will be found pervading my endeavours to attract the attention of my readers to the salient points of importance connected with the designs for ships of war, but that could hardly be avoided in an essay which seeks to embrace under different distinct aspects all the leading features of a problem so complex in its relation to the exigencies of modern naval warfare. It must also be observed, too, that the opinions expressed throughout this book, with the two last chapters, were written previous to the date of threatened hostilities by Russia on the Afghan frontier of India; but the preparations which have been made in prospect of a war with only a third-rate naval Power, and the lengthened period taken up by those preparations, and the fact that it has been deemed necessary to exhaust the entire naval resources of this country for the defence of our empire as against Russia alone, has produced the strongest evidence of the inadequate strength of our fleet for a naval war of larger dimensions, and of the unprepared state in which we should have been found in the event of a more sudden outbreak of hostilities.

It has been said that naval officers would best promote the interests of the service by refraining from criticism and argumentative discussions, as having a tendency to discourage

expenditure, but this advice, if adopted, would lead to evils of greater magnitude, by narrowing the scope of professional intelligence, and perpetuating blunders which may endanger the very existence of our empire. I regard such a policy of masterly inactivity as hazardous in the extreme, and as I value the light more than the darkness, I make no apology for publishing my opinions.

If this book should only lead to more thoughtful inquiry in naval circles and to wider discussion, I shall have been amply rewarded for my labour.



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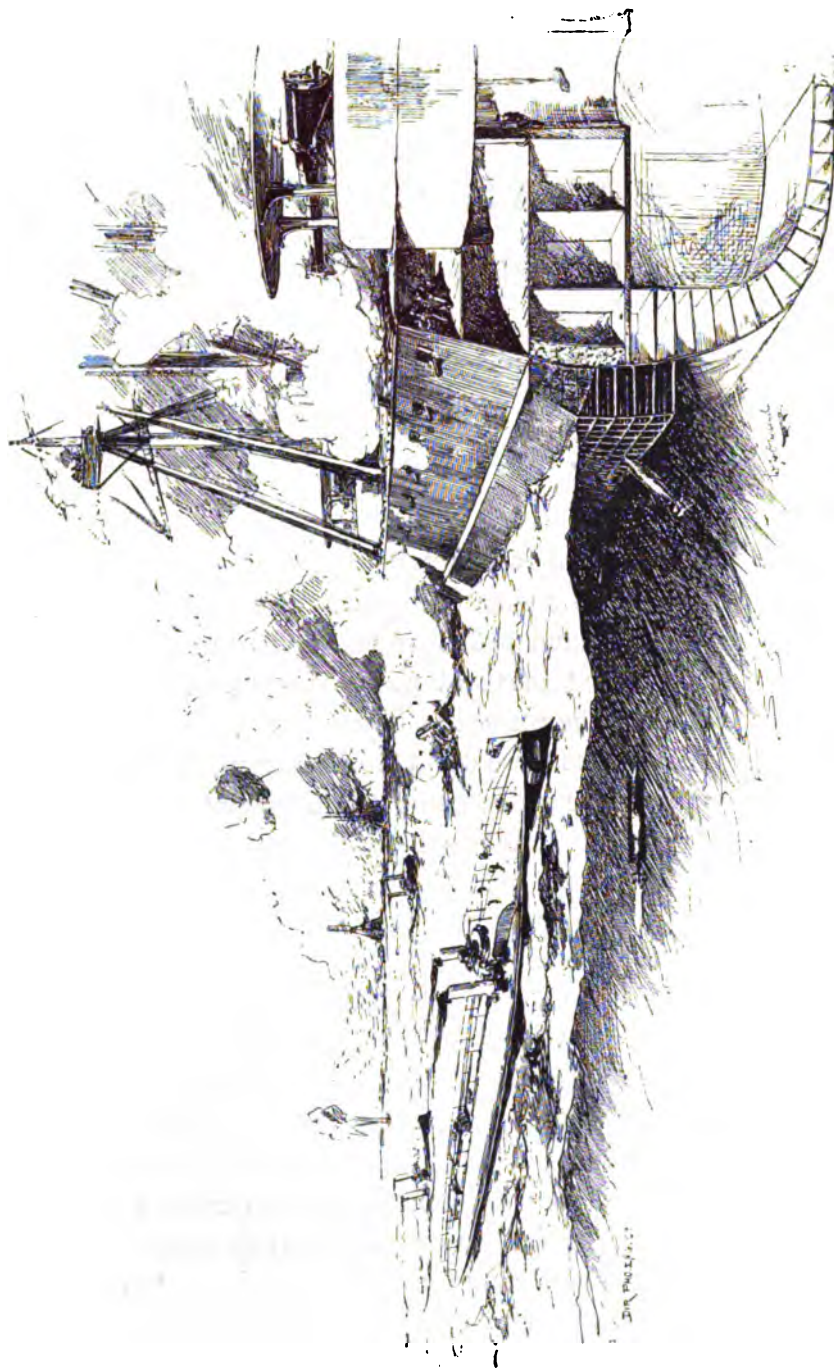


PLATE I.

LINE-OF-BATTLE SHIP WITH FIXED CRINOLINE AND CELLULAR DECK PROTECTION REPELLING TORPEDO ATTACK.

*Note.*—The crinoline should extend downwards to 16 or 18 feet below water-line.

[To face p. 1.

# FUTURE NAVAL BATTLES, AND HOW TO FIGHT THEM.

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## CHAPTER I.

### LINE-OF-BATTLE SHIPS AND TORPEDO VESSELS.

THE tactics which will rule naval battles under the existing order of weapons of offence will be regulated by such circumstances as the state of the weather, and the character and numerical proportions of the component parts of hostile forces, and the order of battle presented by the respective fleets.

In days of yore, fleet actions were decided by the gun, loss of masts and injury to hull above water being the principal cause of disablement and capture. In future battles between fleets, in addition to the gun attack, ships will be assailed below water-line by the ram and torpedo, and a force of sea-going torpedo vessels accompanying each fleet will have to be accounted for, and will take a most prominent part in the strife for victory.

In order to describe a *modus operandi* for naval warfare in the present day, it is necessary to distinguish between fleet actions and squadron or single actions, the two latter offering special facilities for manœuvring which will not be available in fleet actions. It will also be necessary to contemplate the effect of contending forces differing in the numerical strength of their component parts, namely, ships and torpedo vessels. Any attempt to generalize on this subject would lead to confusion of ideas, and therefore it is proposed to consider separately the

## 2 FUTURE NAVAL BATTLES, AND HOW TO FIGHT THEM.

distinctive aspects of naval battles, and my first subject will be that of fleet actions between equal forces and similar component parts, giving prominence to the part which will be taken by sea-going torpedo vessels.

In order to avoid confusion of ideas, it is necessary to bear in mind that all the circumstances of battle, and the tactics which can be resorted to in sea fights between single ships or small squadrons, will differ entirely from those which will be admissible in fleet actions, owing to the limited space for manœuvring and the exigencies of the order of battle.

We would contemplate, therefore, the occasion of two hostile fleets meeting at sea, composed of an equal force of fleet ships and torpedo vessels. Let us suppose for the occasion that the weather is moderate, the first question which arises is as to the tactics to be pursued with the torpedo vessels, those carried on shipboard, and those of a larger class known as sea-going; as the dexterous handling of this modern and formidable weapon of offence will probably decide the fate of future naval battles.

It may be expected that whilst the former class of torpedo vessels would only be made use of as appendages to the ships they belong to, the latter class would take a more independent part in the battle; for instance, supposing that fleet A places his torpedo force in advance of the battle, fleet B would probably do likewise, and what would be the result of this flotilla encounter between vessels of 20-knot speed? The opinion generally entertained is, that torpedo vessels would attack torpedo vessels, and thus safeguard the armour-clads, and that then would come the tug of war—fleet ships *versus* fleet ships; but this off-hand mode of disposing of this critical question does not appear at all convincing, and in the opinion of the writer it appears far more probable that these torpedo vessels, advancing at great speed, would not stop to engage each other, but pass on to reach their goal and attack the big ships.

In this passing encounter some casualties would naturally occur from machine-gun fire and collisions, but the main body would use their utmost endeavour to carry out their final pur-



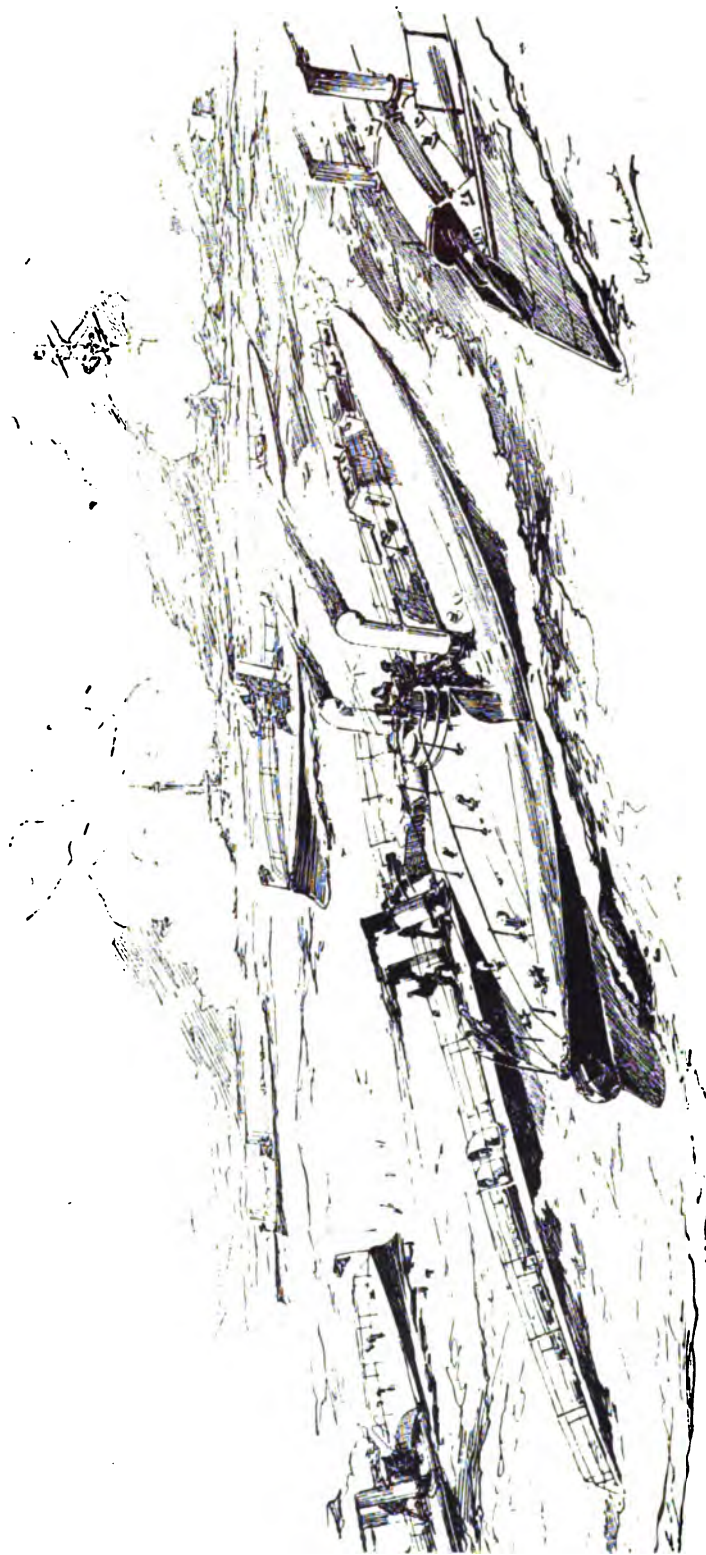


PLATE II.

YARROW SEA-GOING TORPEDO VESSELS PASSING EACH OTHER TO THE ATTACK OF LINE-OF-BATTLE SHIPS AT A SPEED OF TWENTY KNOTS AN HOUR.

[To face p. 3.

pose, that is, to destroy the fleet ships (*vide* Plate II.), and the same argument holds good in my opinion with regard to the so-called torpedo catchers which are being introduced, a small class of gun vessel intended to accompany a fleet for the purpose of meeting and destroying torpedo vessels, and thus protecting the armour-clads.

It must be borne in mind that machine-gun fire aimed from these catchers at torpedo boats approaching at full speed end-on will be deflected and therefore harmless, and that it will only be at the moment of passing each other that the catchers will be able to deliver their fire with any vulnerable effect, and even then the hits will be uncertain and not necessarily fatal. The torpedo boats will not be idle with their machine guns, and wave motion will impede accuracy of fire; they will also be smaller objects to hit, and although some of them may be disabled on both sides in the flotilla encounter, yet the greater number will run the gauntlet in safety.

These catchers cannot possess the same speed as the torpedo boats, and therefore when the opportunity is offered, the latter would always be enabled to escape; and as two or three torpedo boats could be built for the same money as one torpedo catcher, it becomes a question of comparative value of expenditure of money whether an additional number of torpedo boats would not render better service in a fleet action, than a lesser number accompanied by some torpedo catchers.

In the absence of any practical experience of the effectual agency of these catchers for this purpose, one can only endeavour to picture the probable scene from imagination as follows:—Two hostile fleets are approaching each other, both fleets send on in advance their torpedo catchers, followed by their torpedo boats; the catchers will naturally come into contact, attack each other, and some will come to grief, and the survivors will pass on towards the torpedo boats who are rushing forward in the smoke at twenty knots' speed to reach the armour-clads; some more casualties will doubtless occur on both sides, but the torpedo boats being the more numerous, some of them

#### 4 FUTURE NAVAL BATTLES, AND HOW TO FIGHT THEM.

will pass through the ordeal unscathed and fulfil their mission by reaching the big ships.

It will also be said that the torpedo vessels will be destroyed by gun fire from the ships before they reach their destination; but whilst moving at twenty knots' speed to meet an object approaching at ten knots' speed, their exposure to gun fire would only be of a few minutes' duration, and looking to the great uncertainty of hits at a small, rapidly moving target, the chances of arresting the approach of a cloud of such skirmishers could not be relied upon, and their onset would be most deadly.

If there is any reality, then, in this prospect of an opening battle by torpedo vessels, what lesson does it teach? Does it not show the immense importance to be attached to the possession of a numerical superiority of those dangerous weapons of naval warfare? And yet whilst the maritime powers of Europe are rapidly increasing their torpedo flotilla for coast defence and for accompanying their fleets, England is standing comparatively idle, and we are told that there is *no danger!*

England is at present the principal workshop for the manufacture of torpedo vessels, and for one million of money, in twelve months' time, fifty of these sea-going vessels could be added to our fleet, and this weak spot in the system of our defence could thus be repaired at a less cost than would provide two additional armour-clads, subject to a delay of five or six years. Yet whilst the fate of future naval battles and our national safety may depend upon the speedy possession of an adequate force of torpedo vessels, we are content to shut our eyes and close our purse-strings, whilst British industry is busily occupied *in arming other nations* with these deadly weapons of offence.

These remarks do not affect the question of the second-class torpedo boats with which our men-of-war are supplied. It is not expected that those boats would be utilized as an advanced guard when two fleets are approaching each other at sea, but rather that they would be kept in hand, and dropped as required or towed into action; but it is not possible to overrate the important part which the larger class of sea-going torpedo



vessels will play in future fleet actions, having a speed of twenty knots, and armed with four torpedoes and some machine guns.

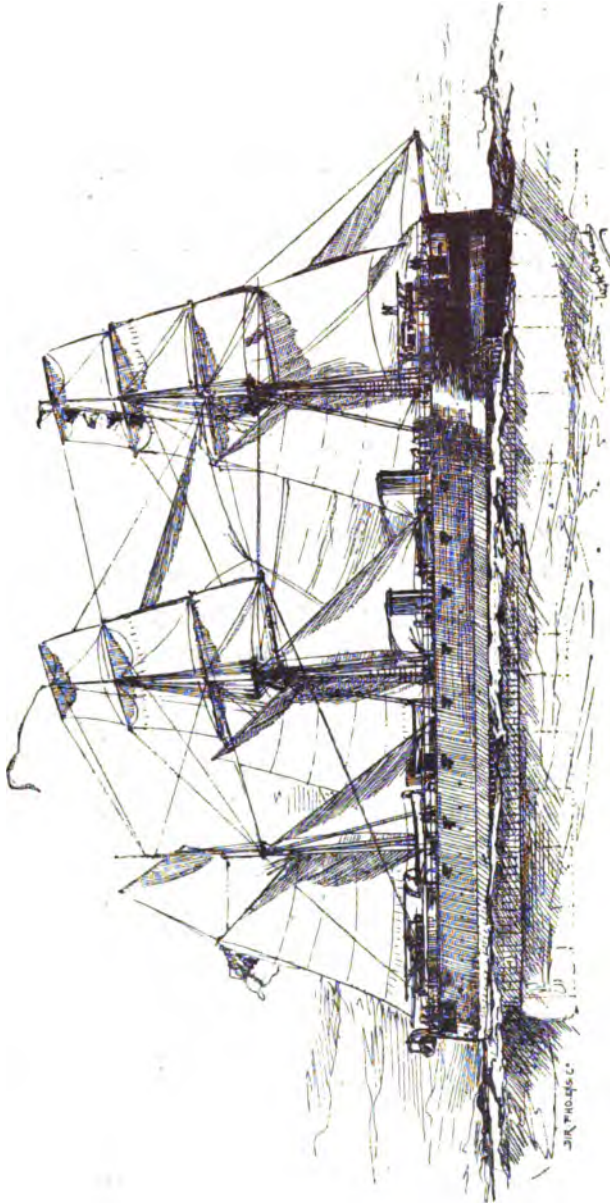
In contemplating this new feature of naval warfare, it therefore becomes a vital question whether fleet ships cannot be better protected against torpedo attack, even at the sacrifice of a portion of the speed.

There is no doubt that fleet actions will in future be mainly decided by the torpedo and the ram, and that the gun attack will only predominate in single actions, and that the introduction of sea-going torpedo vessels must be regarded as a prominent feature in estimating the strength of the navies of Europe; and looking to the deadly blows they would inflict, it is of the highest importance to consider whether with regard to ships intended to fight in masses, and when great speed is not an essential element of fighting power, some substantial protection against torpedo attack cannot be devised for these classes of war ships, some outwork, in fact, which will interpose a cushion of water and air as a protective medium to the inner hull of a ship against the explosive force of torpedo fire. Experiments have been made with hanging screens of chain network, but these fail to meet the conditions of ships passing through the water at even moderate speed, especially with rolling motion, and they are extremely cumbrous and double up, and are likely to break their fastenings, and thus this netting might easily drop astern and foul the screws. It therefore appears that something more substantial and rigid is required to resist the shock of the existing class of torpedo.<sup>1</sup> The object to be obtained is so vital that it should be sought for at any cost of other less vital properties.

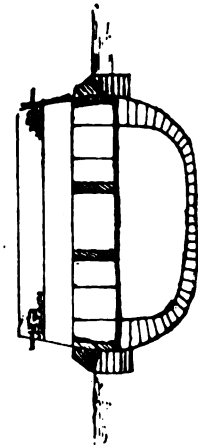
Plate I. shows a rough design of a fleet ship thus protected, which was submitted to the Admiralty by the writer in April, 1876, but has, as yet, received no attention. The advance made since that date in torpedo ocean warfare justifies this suggestion being brought to the test of actual experiment without loss of time, to ascertain what strength of steel fixtures

<sup>1</sup> The Lay torpedo need not be considered as applicable to fleet actions.

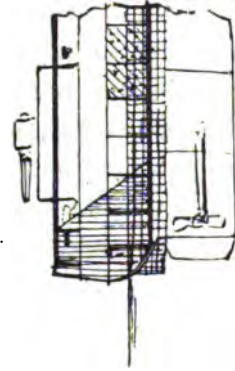
# 6 FUTURE NAVAL BATTLES; AND HOW TO FIGHT THEM.



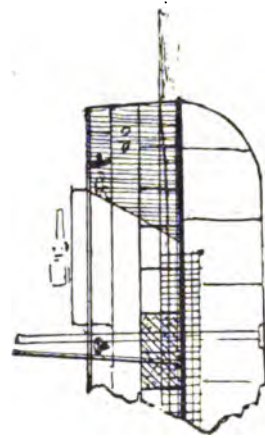
TYPE OF FLEET SHIP UNDER STEAM AND SAIL, WITH CRINOLINE PROTECTION TO EXTEND DOWNWARDS 15 FEET BELOW WATER-LINE.



SECTION. AMIDSHIPS.



STERN.



BOW.

PLATE III.

would suffice to resist the torpedo attack, and what depth of combined cushion of water and of cellular side would save the inner ship from destruction by a torpedo exploded at the outside of this crinoline protection.

This question is so momentous that it would justify a considerable sacrifice of speed in fleet actions to obtain some prospect of keeping ships above water, which should be the main object sought for. The writer is fully aware that objections will be raised against the loss of speed which would result from this mode of protection, but, according to a calculation made for him by the late Mr. Froude, that loss would only be one-sixth of the ordinary speed, and it is not proposed to make this sacrifice in that class of fleet ships intended for foreign service and to cruise alone, where the highest speed is an essential element of fighting power, and where by skilful manœuvring the ram and torpedo can be avoided.

The great mistake which has hitherto been made, has been in the attempt to combine in the same design all the elements of fighting perfection suitable both for fleet actions and for single combats, which has resulted in loss of efficiency for both purposes; and the sooner it becomes admitted that two distinct classes of fleet ships are essential, the better it will be for England's naval power. At the same time it is understood that a squadron of the fastest type would be most needful to accompany each fleet of the slower line-of-battle ships.

The characteristic properties of the class of ship proposed by the writer for fleet actions may be described as follows:—

1. A short and broad and strong bowed ship, with a tumble-home side, and of deep draught of water and moderate displacement.

2. A cellular ship both above and below a *submerged armour-plated deck*, placed five feet below water line, the bow and stern only being cased with armour.

3. A recessed side of hull at the water line, this recess to be protected by a stout fixed network, extending fifteen feet downwards to arrest the blow of the torpedo, but not carried round

## 8 *FUTURE NAVAL BATTLES, AND HOW TO FIGHT THEM.*

the bow, as increased cellular protection with cork fillings can be afforded to that part of the ship.

4. The cellular side below the armour-plated deck should be of the greatest depth consistent with the breadth of ship required for the engine-room, the steel plating of the inner skin being of increased thickness, and if possible the inner skin of ship should be at a distance of twelve or fourteen feet from the outside crinoline protection.

5. Added to a fore-and-aft water-tight bulkhead below the armour deck, the hold should be divided into as many transverse cellular compartments as possible, and above the armour deck this cellular principle should be carried out upwards to five feet above water line to such an extent as to form a raft body of water-line protection, and thus to localize and reduce to a minimum the admission of water into buoyancy spaces, at the same time relying upon every means which can be devised for quickly stopping shot holes and repairing damages.

6. The coffer-dam sides filled with compressed cork should surround this raft body, whose covering deck should be fitted with gratings so as to admit of the gas from exploding shells finding an escape upwards, and the cells in this raft body might be used for the stowage of appropriate materials, such as water, coal, provisions, cordage, &c.; and as a valuable protection against raking fire, a portion of the raft body athwartships at the fore and aft ends, say about one-fourth from the bow and stern, should be appropriated for the chain and hemp cables, and sails, and seamen's bags. The coffer-dam protection should also be applied round the hatchways.

7. The armament proposed affords a powerful "end-on" as well as broadside fire and any superstructure which interferes with the training of bow and stern guns is most objectionable.

8. The rig proposed is tripod masts, double topsails, and topmast and topgallant masts in one, and an abundance of fore and aft sails, no royals or studding sails; the spread of canvas being more moderate for fleet services than for foreign cruisers.

9. The novel feature of design is the projecting side at the water line to admit of a recess below, thus affording a water cushion to minimize the effect of torpedo explosion.

10. It will at once be seen that the object aimed at is to obtain the greatest amount of protection to buoyancy against the combined attacks of the gun, the ram, and torpedo, consistent with perfect security to magazines and boilers—in fact, the greatest amount of *fighting vitality*.

11. The sacrifice required to be made for this torpedo netting will proceed from its additional weight, say altogether about forty tons, and from the loss of speed involved, which, according to the late Mr. Froude's calculation, would be a loss of one-sixth, so that the speed of a twelve-knot ship would be reduced to ten knots; but for fleet actions a moderate amount of speed would suffice, and its importance is not to be compared to that of protecting ships from being sunk.

It is only natural to suppose that objections will be raised against this mode of torpedo defence, but the main point of all is, whether ships are to sink or swim in future fleet actions, and this method of defence possesses the great recommendation that it can be applied to armour-clads already built or building, and the crinoline need not be worn, except in view of a naval war.

#### DESCRIPTION.

A block or fender of wood or iron construction is fastened round the ship's side to form a recess below the water line of five feet in depth, from which downwards for fifteen feet a fixed crinoline is fastened to the ship as follows:—Stays of two-inch steel rod are screwed into the ship's side with eyes at the end through which horizontal one-inch steel rods are rove, and then vertical half-inch rods of short lengths are fastened to the horizontal rods with nuts and screws for removal or shoring ship when docking.

If the method I have proposed is not perfect in its conception, then let it be improved upon, but at any rate let us not shut

our eyes to the danger which awaits torpedo warfare, if by any means it can be mitigated.

The question involved, is simply whether all has been done which practical science can propose to protect our ships from going to the bottom, with all their treasure in guns and equipment and their living freight, in future battles at sea (*vide* Plate IV.).

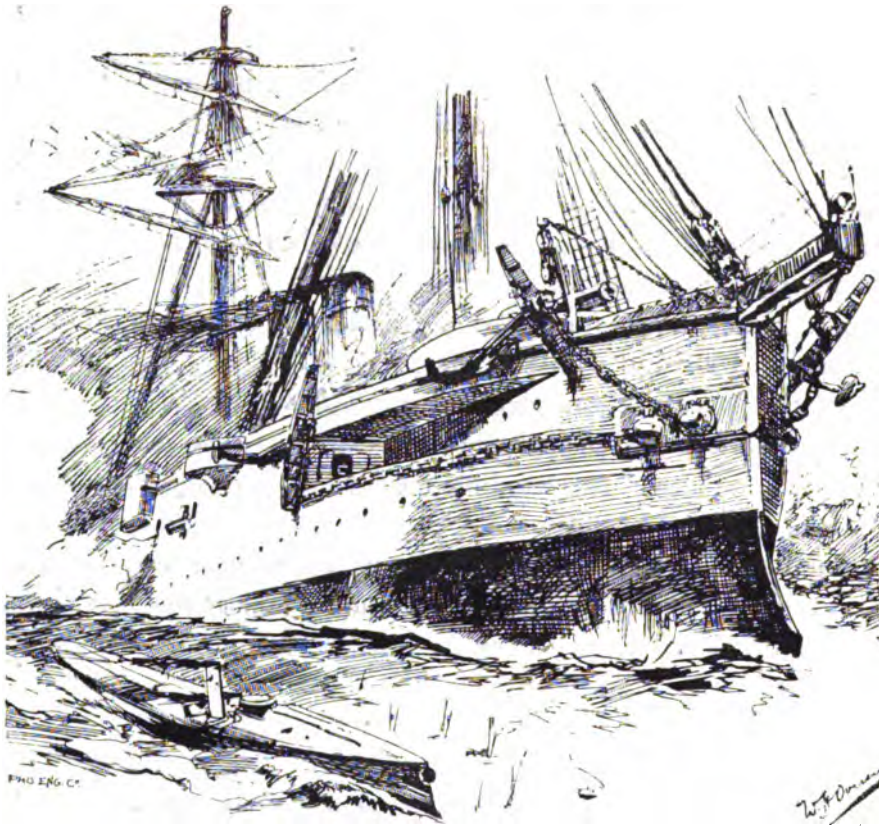


PLATE IV.

SHIP OF "TEMERAIRE" TYPE SINKING BY THE STERN, AFTER BEING TORPEDOED AFT.

It is known that a fish torpedo, exploding in contact with any inclosed floating body exercises its greatest power of destruction, and also that a cushion of water between the bursting charge and that body is the best agent for dispersing and lessening the explosive force. Hence there is reason to believe that the proposed plan for presenting a water cushion,

and deep cellular side, and stout inner skin of ship, say two inches steel, would save a ship from fatal injury.

I am glad to find that Sir Edward Reed has also turned his attention to the possibility of defending ships against torpedoes, and has proposed a design for an armour-clad which is described in Chapter VII. :—

The strongest evidence of the importance which is attached to torpedo naval warfare has been supplied by the Berlin correspondent of the *Standard* in its issue of the 4th of June. Not satisfied with the security afforded by a whole nation in arms against any probable land attack, Germany has decided to spare no expense upon her sea defences. These are now being thoroughly organized under the guidance of a combined naval and military committee of experts. The number of torpedo vessels, which will form part of these defences, is about to be raised to 150; and whilst France, Russia, and Italy are equally active in this direction, England is content to add only a few of these sea-going vessels to her navy in the current year, well knowing that her surrounding coasts are unprotected by this available means of defence.

Looking to the numerical inferiority of the fleet we possess as compared with the naval forces found requisite for protection in former wars, and with the strength of the existing navies of Europe, Admiral Sir Edward Fanshawe, in a letter to the *Standard* of the 4th of June, quotes the words of that great apostle of peace and economy, the late Richard Cobden, as follows: "I would, if necessary, spend one hundred millions sterling to maintain an *irresistible superiority* over France at sea." Would that his like could be found now amongst the present-day patriots of the Liberal party in the House of Commons to protest against a policy of inactivity and retrenchment which has rendered our supposed naval supremacy a scoff amongst other nations and a sure prelude to the downfall of our empire.

To rely upon recovering our lost ground by a moderate increase of our navy estimates, is simply to contemplate con-

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tinued peaceful relations with foreign powers, obtained by a constant concession of our national interests to unjust demands. A large increase in our sea-going torpedo flotilla is a matter which could be fully secured in twelve months, and which would place us in comparative security while line-of-battle ships are being designed which shall not sink in action.

In the words of Lord Salisbury at Devonport on the 4th of June: "The interests which depend on the thorough maintenance of our navy involve the existence of our hearths and homes; they involve the national traditions of our existence: and no real doubt ought to be allowed to exist as to the possibility of the success of any enemy that chance may bring against us."



## CHAPTER II.

## RAM ATTACK AND DEFENCE.

IF it can be shown that a sufficient amount of speed may be obtained in conjunction with some means of defence against torpedoes such as has been suggested in Chapter I., without seriously lessening the offensive power of the ram and the gun in fleet actions, it becomes a matter of paramount importance that this element of safety and fighting endurance should be provided. I am quite aware that any impediment to speed caused by such a retarding medium as the proposed fixed torpedo netting will, to a certain extent, militate against *expert ramming*, inasmuch as although a moderate speed would suffice for manœuvring in fleet actions, yet a reserve of speed would on certain occasions facilitate rapid movements and short turning; but I consider that this loss is more than compensated for by the security afforded against the destructive effects of torpedo explosions. And I think that if the selection was offered to captains between two ships destined to be employed in *fleet actions* equally powerful in all other respects, with the exception that the one was protected against motive torpedoes and the other without such protection, but with greater speed—I might even say fourteen knots in lieu of ten—that there would be no hesitation as to the preference being given to the protected vessel.

There appears to be a disposition to speak lightly of the probable success of torpedo vessels in fleet actions, and great reliance is placed on machine-gun fire to prevent their near approach; but I feel assured that a little actual experience

would reverse this opinion, and bring prominently to light the importance of some more reliable guarantee of safety to the vitals of a ship in action, even if accompanied by a considerable loss of speed.

It has been said that if you protect ships against the motive torpedo of to-day, a more heavily loaded weapon will be introduced; but the same objection has been raised against armour-plating, and it may be advanced that more powerful torpedoes will entail larger vessels to carry them.

The bigger the object to be fired at, the more easily will its approach be arrested by gun fire. Increased cost will also diminish their number, which at present renders them so formidable.

After the torpedo, the most deadly weapon of offence in fleet actions will be the *ram*. It is therefore intended, on the present occa-

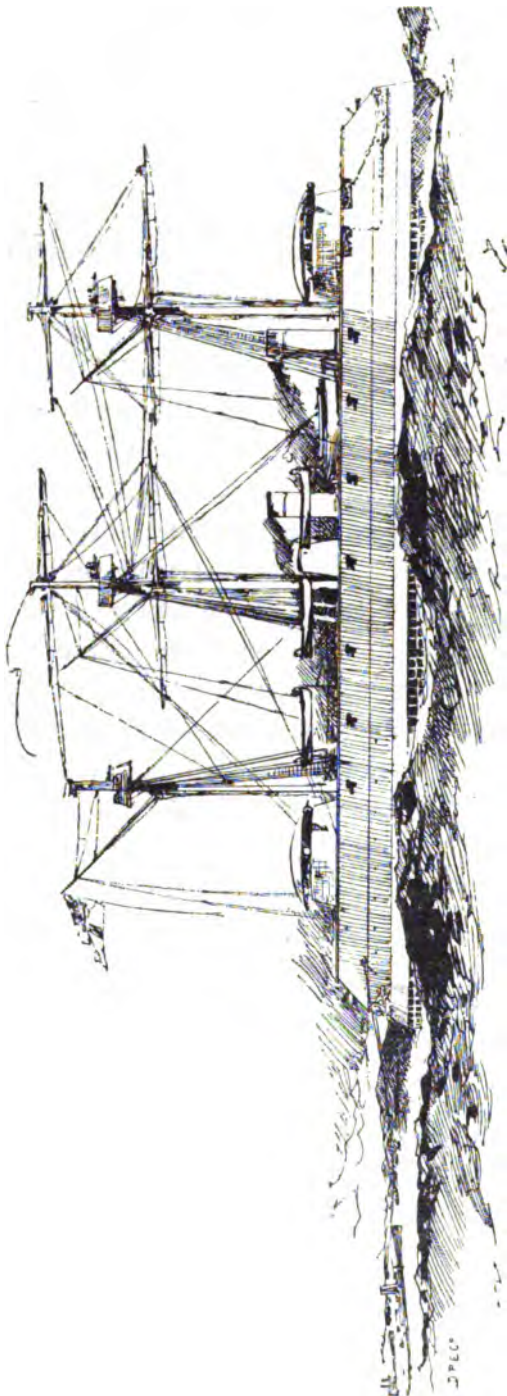


PLATE V. NEW TYPE OF RAM-BOWED FLEET SHIP WITH DEFENSIVE NETTING AGAINST TORPEDOES, PREPARED FOR ACTION.

sion, to take a prospective view of the incidents of *ramming*, and to consider the tactics which will regulate this mode of attack, and the extent to which these ram tactics should govern the design and construction of the class of fleet ship intended to fight in the line of battle.

It may be laid down as an axiom in naval warfare, that the tactics which are applicable to single combats will not be available in fleet actions, and therefore that the type of ship intended for cruising alone at sea should differ materially in fighting qualifications from that class intended for the line of battle. In the first place, where there is open space for manœuvring, *great speed* will prove an important element of fighting power, by enabling a ship to bring on an action or to avoid an action, and also to select her own distance and mode of attack, and thus to avoid the ram and torpedo. In that case the gun power will predominate; whereas, in fleet actions, when the facilities for manœuvring will be greatly limited, and the order of battle must be maintained, and when ships must come to close quarters, they will be unavoidably exposed to the ram and torpedo attack, against which handiness, and not speed, will prove to be the greatest safeguard. The ram and torpedo, under such circumstances, will prove more destructive than the gun.

Great mischief has been done to the efficiency of our fleet by the endeavour to combine all the elements of fighting power in one class of armour-clad without due regard to the tactical considerations involved under different conditions of naval warfare. The result being that the cruising ship will not excel in speed, and in those special qualifications most needful for foreign service and single combats, and the fleet ship will be wanting in handiness and in those features of fighting endurance which will essentially contribute towards the maintenance of our naval supremacy.

All naval officers have recognized the important part which the ram should take in fleet battles, but the structural strength developed in the bows of all our ships is so insufficient for the purpose intended, that the danger of self-destruction has had

a demoralizing effect. It appears to be assumed that this mode of attack will be limited to the endeavour to strike on the broadside, and that the meeting bow-to-bow or end-on ram collision will, as a rule, be avoided by mutual inclination.

I differ entirely from this view of what may be expected to occur in fleet actions. I believe that bow-to-bow rammings will be the ruling feature of the fights, because ships will naturally turn towards each other for self-defence. The strongest bowed ships will therefore compel their opponents to meet them end-on; and these bow-to-bow encounters will be as skilfully fought as duels with the sword, each captain watching his approaching foe with eager attention, and striving, by skilful steering, to bring his stem to strike at an angle of inclination towards his opponent's bow. Short ships with great rudder power and strongly fortified bows will come off victorious in this mode of attack, and a good nerve and a quick eye and skilful use of the helm will conduce to success; and it should be borne in mind that proficiency in the art of ramming can only be acquired by practice—a part of the education of our young officers which has been totally neglected. It is therefore most desirable that a school for practical training should be established at our home-ports, and carried out, as far as possible, on foreign stations, and that it should form part of the curriculum for the education of naval officers.

After fleets first meet each other, the battle will become a *mêlée*, and a sharp look-out will be kept in every direction for a chance of ramming, and I reckon that rams, and not guns, will become the main source of victory. If my judgment is correct, what lesson does it teach? Does it not expose the fallacy of building large unwieldy ships with weak and unprotected bows? Does it not recommend a larger number of smaller vessels with rapid turning power and strongly fortified bows, even if somewhat less powerfully armed? Would not a fleet of sixteen of such ships of the line, of 8000 tons displacement, with cellular deck protection, be more than a match for ten armour-plated ships, of 12,000 tons, looking to the contingencies from ram

and torpedo attack? I very much question whether an equal number of the smaller and handier vessels would not have the best of the fight in fleet actions. It may be said that the monster class of fleet ship would, in such a case, with their greater speed and gun power separate, and fight at long balls, thus avoiding the ram and torpedo; but I cannot perceive what advantage would be gained by any such tactics, as the smaller vessels, by keeping more together, and by turning their armour-plated bows to the enemy, would present a smaller target. Shots reaching their aim would be deflected, whilst the larger ships would have to expose their sterns. It must also be remembered that the collective gun power of both fleets would be the same, only "so many eggs would not be in one basket," but more distributed—a decided advantage—and the expenditure of money in both cases would be the same. The first step towards an improvement in this direction will be to abandon central citadels and also belt armour of less than twelve inches thick, and to adopt the cellular principle of water-line protection to buoyancy with the submerged armour-plated deck, which, by lessening the burden of dead weight to be carried, will dispose of the motive which has led to the building of monster ships. Whilst objecting entirely to the *Polyphemus* class of ram as an improvident expenditure of money, and whilst upholding the mounting of the most powerful guns in barbette towers in all fleet ships, with a number of unprotected light broadside and machine guns, I maintain that greater attention should be paid to those inherent qualities which constitute efficiency in ramming; as it must be borne in mind that smoke and rolling motion will greatly limit the accuracy of the gun attack, and that in fleet actions there will be some danger that ill-directed shots may reach a friend in the line of fire.

I will now offer some remarks about the *spur* in relation to ramming, and the advantages of a stout submerged armour-plated deck as a powerful agent of efficiency in this mode of attack, apart from the security it affords against vital injury

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from shot or shell. If a ship succeeds in delivering the ram blow, it does not signify whether the inlet of water into the hold below the water-tight deck is low down or higher up. The larger the opening made, the more serious the effect produced. A crushing blow will probably prove more vital than a narrow incision made by a spur; but the properties which will facilitate

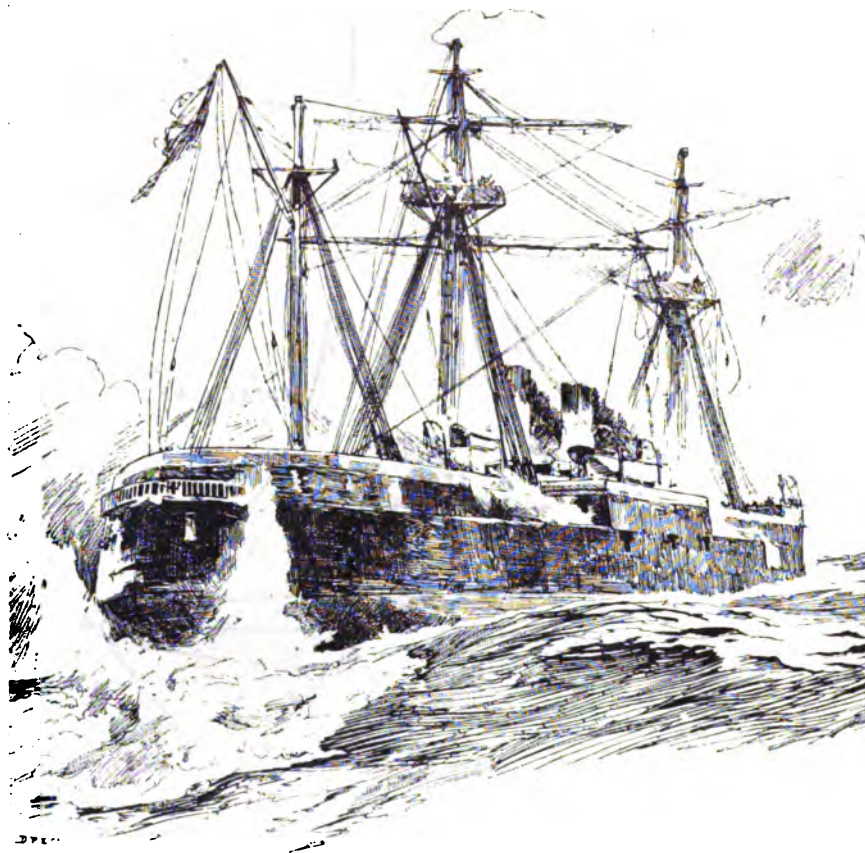


PLATE VI.—SHIP OF "ALEXANDRA" TYPE SINKING BY THE HEAD, AFTER BOW-RAM ENCOUNTER WITH STRONGER-BOWED SHIP.

ramming in fleet actions will be the power of turning on the smallest arc of a circle, and the possession of great structural strength at the point where the blow is delivered. Both the English spur and the French snout are comparatively weak constructions, and are therefore liable to prove self-destructive by tearing open buoyancy spaces when being disengaged after

collision, if not by ruptures caused in the act of striking. It is therefore objectionable to encumber a vessel with a protube-

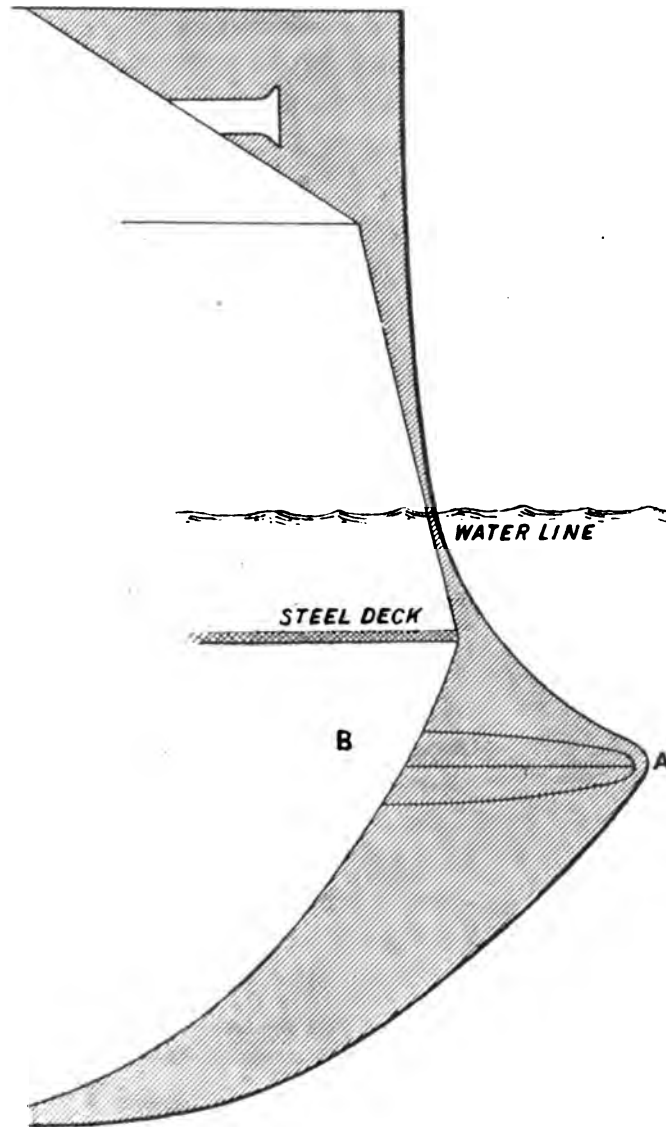


PLATE VII.—A. "COLOSSUS" TYPE, RAM BOW, WITH SPUR CAUSING LATERAL RESISTANCE.

B. PROPOSED RAM BOW, SHOWING REMOVAL OF LATERAL RESISTANCE TO TURNING.

rance which is an impediment to short turning, and which may pin a ship by the nose, and probably swing her round and expose

her broadside to be rammed by an advancing foe in the line of battle. Plate VIII. illustrates this disaster. The object to be sought for is, to crush in the bow or the side of an adversary, and then to be quickly liberated without suffering self-injury; therefore any weak structure acting as a holdfast is objectionable. In addition to fortifying the bow by every possible means, the foremost compartments below water line should be filled with cork or some other light material to prevent an inlet of water.

Plate VII. shows a formation of bow which would possess the merits above described. It will be seen that the point of impact, when ramming, would be at the apex of an obtuse angle, formed by a submerged armour-plated deck, the stem receding slightly above and below this point. As this horizontal cleaver is supported by the whole structure of the ship, enormous rigidity is thus concentrated where the blow will be delivered, and as the bow is armour-plated, the liability to self-injury would be reduced to a minimum. The absence of the spur would remove the hindrance to short turning. I consider the plan pursued, of depressing this armoured deck at the fore end, creates an element of weakness both as regards the ram and gun attack; because the bow structure above this deck is weakened, and because it facilitates penetration by depressed bow-fire at close quarters.

The safety of a ship when rammed on the broadside, will depend entirely on the size of her cellular compartments below water line. No war ship should be sent into action if the filling of any two compartments would jeopardize her buoyancy. The supreme effort of our naval constructors should be to render a ship as unsinkable as possible. The danger of being sunk is far more to be apprehended from the ram and torpedo, than from the gun attack. The submerged armour-plated deck and cellular water-line protection would render a ship comparatively safer against being sunk by shot or shell than any water-line armoured belt which can be carried, except by ships of objectionable size. By disposing of side armour, a sufficient weight becomes available for increasing the amount of cellular



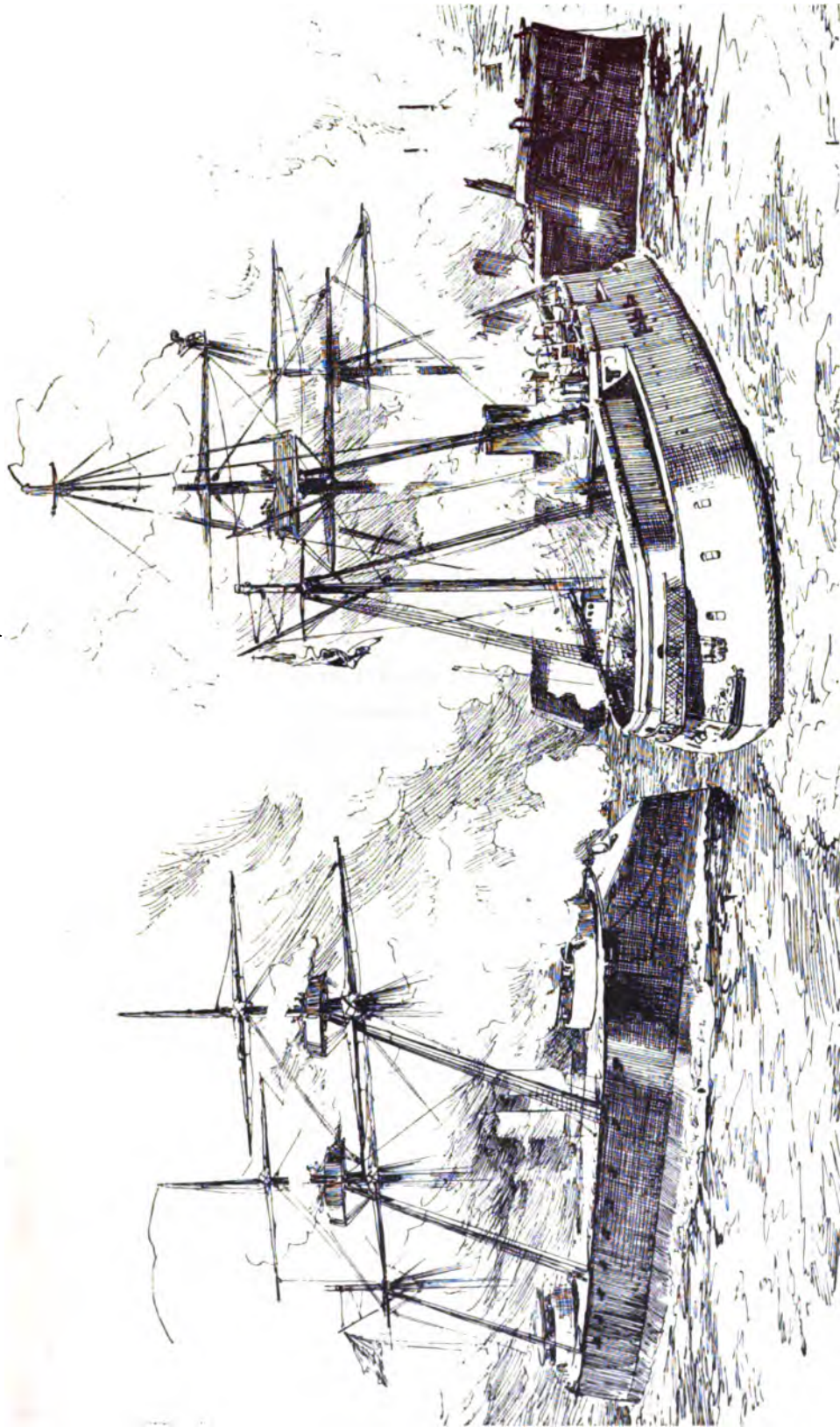


PLATE VIII.

SHIP CAUGHT BY SPUR WHEN END-ON RANKING, AND BEING SWUNG ROUND, EXPOSES HER BROADSIDE TO BE RAMMED BY FOLLOWING SHIP OF OPPOSING FLEET.

[To face p. 20.







protection throughout the hull of a ship. In contemplating the opportunities which will arise for ramming in fleet actions, it must be foreseen that the blinding effect of smoke will introduce many sudden and momentous occasions for this mode of attack; when the power of turning these occasions to the best account will be at the command of the handiest vessels. This prospect also points to the great importance of unmistakable distinguishing marks being adopted previous to battle in order to recognize friend from foe. An order of battle favourable for ramming would be groups of threes with leaders in line abreast. This order of approach would, by the performance of one rapidly executed manœuvre at the last moment, enable a preponderating force to be directed upon a weaker part of the enemy's line of battle, either to attack the centre or wings. Having advocated a moderate rate of speed for one class of fleet ships intended for fighting in line of battle, *I fully recognize the importance of a reserve squadron of the swifter class being attached to a fleet to act independently of the main body.* The skilful performance of one manœuvre on the near approach of hostile fleets will go far to decide the fate of future battles, after which the groups will probably look to support their respective leaders.

The question of night actions between fleets is another feature of naval warfare in which the most prominent distinguishing marks will be most needful, and in which success will mainly depend upon preconcerted arrangements by fleet commanders with their captains. It is to be hoped that although the sailor element aloft will not form part of fighting superiority, yet that proficiency in those other qualities which have exalted the British seaman in days of yore still exists, and will not be without its effect on the result of future naval victories.

#### SPEED AND HANDINESS.

As the acceptance of the views I have expressed will greatly depend upon the relative value which is given to speed and handiness in fleet actions, and on the relationship which these

two qualifications bear towards each other; and as these are questions with regard to which naval officers appear to have formed somewhat indefinite ideas (as may be seen by the discussion which followed the reading of my paper on Ramming, at a Public Institution in February, 1884), I think it will be useful that I should refer to what was said on that occasion, especially as I was unable to make any reply at the time to the various opinions expressed. Some of those officers who took part in that discussion may fairly be considered as experts on naval tactics, namely Captains Freemantle, Colomb, Long, and Noel—all distinguished as prize medallists for essays on tactical subjects. On reading over the remarks of these officers, I find that Captains Freemantle and Noel were almost entirely in agreement with the opinions I had expressed, whilst the other two medallists differed mainly on the relative value of speed and handiness, and their relationship to each other.

I was struck by a remark of Captain Long, when he said, "I have followed for some years with great attention the opinions of various officers on the subject of naval tactics, and anything more different or more unsatisfactory it is not possible to conceive."

There is much truth in this remark, and it is much to be regretted; but I am convinced that if these subjects were submitted to the crucial test of collective investigation, a consensus of opinion would be arrived at certainly as regards the broad principles of fighting dexterity. This enlightenment is much to be desired, as it is generally admitted that tactics should govern design and construction. This want of agreement, together with constant changes in the personality of the Board of Admiralty, and preponderating civilian control, must injuriously affect the efficiency of the fleet, and will prove still more disastrous if a naval war should come upon us, and it should be found that other naval powers have, by means of systematic and searching inquiry, brought these subjects to more practical conclusions in the embodiment of their fleets. Some brighter light would be thrown upon the intentions of our

administrators, if the special service for which each ship was designed was made known at the time of her being laid down. Her specialities for that particular duty would then be made manifest; whereas at present the square peg is often found to have been placed in the round hole. Vessels with small defensive power are sent abroad with inadequate speed to escape capture, whilst with others of Samsonian capacities great speed is combined. I think I may assume that it will be universally agreed that distinct conditions of battle will rule in fleet actions as compared with what will be available in single combats. That whilst in the one case the fight will resemble a tilt in a *mêlée*, in the other case the field of operations will afford the greatest freedom for skilful manœuvring. Therefore as the available mode of fighting will differ, so should those features of design and construction vary which will conduce to efficiency. It will also, I think, be admitted that the possession of great speed will be less efficacious in fleet actions than in single combats, and that handiness will prove more useful in the former case than in the latter. If these conclusions are accepted, I think I may take another step forward on the road to general agreement. This is, that it is essential for the greater efficiency of the fleet that there should be two classes of fleet ship—one for the line of battle, and the other for colonial service.

I will now endeavour to bring the naval service into closer agreement on another point relating to speed and handiness, as I should be glad to remove the reproach thrown upon us by naval constructors, namely, that we cannot agree even on broad principles of naval tactics.

As a representative officer, Captain Long writes as follows:

“As to the handiness, I think there is no doubt whatever that the great thing affecting handiness, *cæteris paribus*, is speed. Turning power, as ships are now fitted, is undoubtedly a function of speed. If you look at the turning diagrams of the *Thunderer*, you will find when she was going eleven knots, she turned faster and shorter than when going nine knots, therefore, &c.” Now these remarks tend to create a wrong

impression as regards the effect of speed on handiness. Of course, if you can increase the speed of a ship without increasing her size, she will turn quicker and shorter, and therefore be handier; but if, in order to increase the speed, you have to increase the length, then she will turn on a larger circle, and, in a confined space, not be so handy. The *Thunderer* turned faster and shorter at eleven knots than at nine knots, because the propelling power already existed in the vessel; but, *cæteris paribus*, would the *Thunderer* have turned still shorter if designed for thirteen knots' speed? Certainly not, if required to be lengthened for the purpose; but put it in another way, *cæteris paribus*, would a smaller and shorter *Thunderer* not turn in a smaller circle, having only nine knots' speed? Captain Colomb is also an advocate for speed before handiness in fleet actions, but a duck hunt with a punt in a pond is an illustration of this subject of contention as regards short and long ships when endeavouring to ram in a circumscribed space. But all naval officers are agreed as to the efficacy of speed in single actions and as regards all classes of war ship intended for foreign service, or for the protection of trade routes.

The effect of the bow-to-bow ram encounter in fleet actions is another tactical problem about which various opinions have been expressed. Captain Colomb evidently discourages the idea of "ramming stem-on to an enemy," as he calls it, but my answer is, that in fleet actions he will have to face that occurrence, if his adversary chooses to invite it. In that dread encounter the helm should be utilized to the utmost to inflict, if possible, *an oblique stem blow* on his opponent's bow, and in fencing for this advantage, the ship that can turn the shortest will, by serpentine manœuvres, have the mastery, especially if she possesses the strongest bow structure (*vide* Plate IX.). I have also advanced the opinion that, *cæteris paribus*, in single actions the strongest bowed ship could compel her opponent either to meet end-on, or else to turn away in due time and make a stern-fight of it. Captain Colomb appears to think that a stern-fight against a fortified bow between two ships



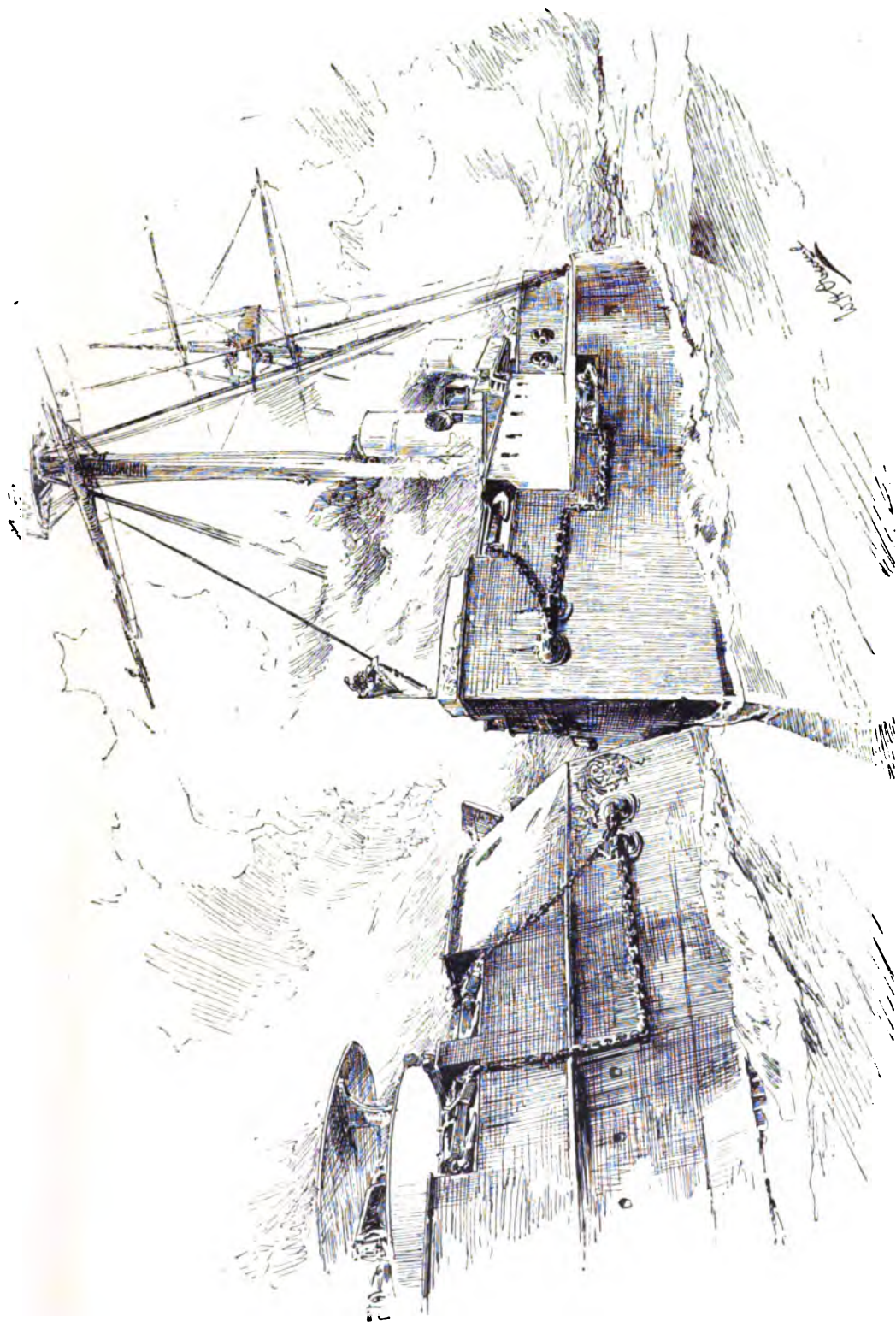


PLATE IX.

A SHORT HANDY SHIP WITHOUT A SPUR BY QUICKER TURNING IS ENABLED TO DELIVER AN OBLIQUE BLOW WITH HER STEM ON THE BOW OF THE ENEMY.

[To face p. 24.]



of equal speed would give the advantage to the ship pursued, on account of superiority of torpedo fire; but, granting this superiority, surely the ship giving chase can select her own distance for the gun attack. The accuracy of direction of the motive torpedo against so small an object as the bow of a ship would be very unreliable, and the problem has to be solved whether a torpedo would not be turned aside by the wave-current produced by the bow of an armour-clad advancing under steam. In all other respects it cannot be denied that the stern, being more vulnerable than the bow, an artillery duel would end disastrously to the ship that sought by a stern-fight to avoid the end-on ram encounter. I feel convinced that these tactical questions only require to be argued out in order to arrive at sound conclusions; and as a means of obtaining a consensus of opinion, the ruling principles of naval warfare should be laid down by a committee of experts and brought under frequent discussion by captains in their respective ships, with the assistance of the "War Game," as being an essential part of the training

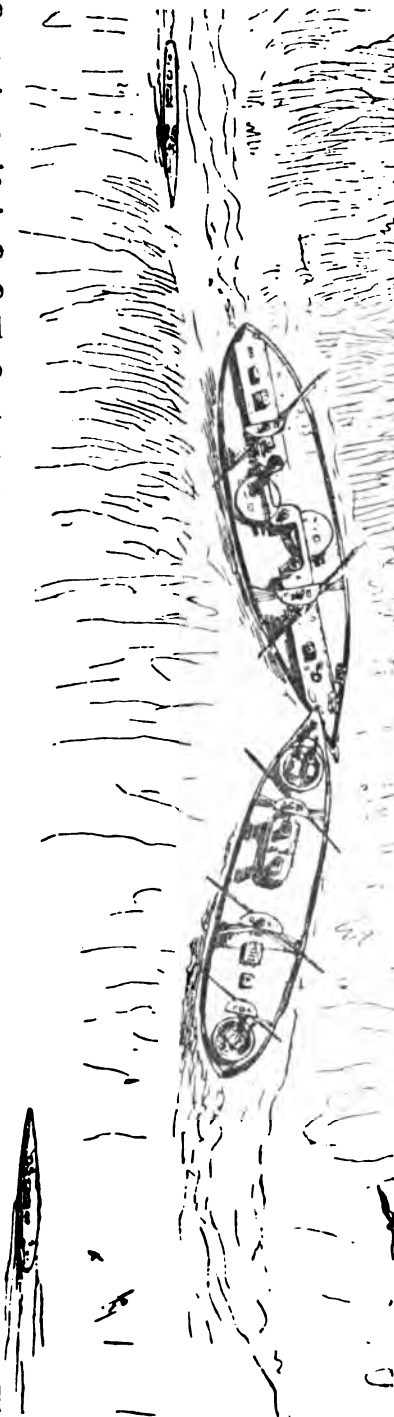


PLATE X.—MANŒUVRING FOR BOW RAM.

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of officers under their command. Altogether I am of opinion that the disagreement amongst naval officers on tactical subjects is more apparent than real. At the same time the unfortunate fact remains that, although the result of future naval battles will mainly depend upon the superior practical training of our rising officers, literary and mathematical acquirements occupy the principal part of their education, whilst the tactics of naval warfare are not even mentioned in the curriculum.

### CHAPTER III.

#### THE GUN ATTACK AND DEFENCE IN FLEET ACTIONS.

It would be futile to attempt to draw any conclusions from naval victories of the past in order to show how battles should be fought in the future. But it may, I believe, truly be foreseen that after hostile fleets sight each other, both seeking to engage, the preliminary tactics will occupy no delay beyond perhaps one timely change of formation ere the encounter begins. Both fleets will, there is no doubt, endeavour to disguise their intended mode of attack. The weather-guage will no longer be an advantage sought to be obtained, inasmuch as the gun platforms will be steadier when ships are bowing the sea than when running before it. But no chieftain would fail to avoid if possible attacking with the sea on the beam.

The smoke question may, I think, be disregarded as not likely to affect one fleet more than another, for if it should blind a fleet to leeward, it will equally blind a fleet from approaching to windward. Manœuvring in smoke may be rendered a dangerous operation, although much will depend upon the strength and direction of the wind; but commanding officers will not like to have their attention drawn off from close observance of their approaching foe, and smoke would offer a serious impediment to the watchful eye contemplating a probable end-on ram attack. Besides which, desultory firing from heavy guns would militate against that preparation for the gun attack at close quarters which would prove far more effective, and even if smokeless powder were introduced, the disturbance caused by the discharge of monster guns on board a ship would interfere with skilful manœuvring. Therefore I think that until fleets have ap-

proached very closely, the bow fire should be kept in abeyance—at any rate the fleet ships which reserve their fire until it can be most effectually delivered will act the wisest part, especially if their bows are armour-plated. The probable speed at which fleets will approach each other when about to engage, and the rapidity with which ships in line of battle will pass each other, will render it most important that the gun fire should be delivered by previous arrangement where its effect will prove most destructive, and not be left to random firing, which might prove very dangerous to friendly ships in the line of fire.

One conclusion, however, may be drawn from the pages of naval history, namely, that *daring and seamanship* (or skilful handling of ships in action) will prove more needful in the future than in the past, and that victorious results will depend more upon the commanding officers than on the crews. It may also be said that steam power will greatly facilitate the endeavours of an expert chieftain to exercise his skill as a strategist, and enable him to throw a superior force of ships upon a weaker portion of the enemy's line of battle. This was Nelson's main source of victory.

The most suitable order of battle in which to approach an enemy, will be that from which any required change of formation can be executed with the greatest rapidity and safety just before the encounter begins. It appears to be generally accepted that the group formation offers certain appreciable advantages over any other, each group being considered as units of the fleet, the group leaders directing their separate movements. At any rate, it must be evident that intricate and complicated manœuvres in the near presence of an enemy should be avoided. I submit that the three following formations would afford sufficient freedom of action for all essential purposes of attack and defence, whatever the order of battle might be in which an enemy's fleet was approaching:—

1. Groups with leaders in line abreast.
2. Groups in two or three columns in line abreast or in echelon.

3. Groups in single line ahead or in echelon.

The change from one formation to another could be readily made so as to concentrate a superior force on any point of the enemy's line of battle, according to its formation, whether extended in line abreast, or line ahead—in fact, to attack either the centre or the wings of his fleet.

I run the risk of severe criticism by offering advice on this important subject, never having commanded a fleet of armour-clads. I have made these suggestions for what they are worth, knowing that opinions will differ, and that the ideas of some officers will probably be more elaborate; but I would impress most strongly the opinion that an admiral's plans should be as simple and definite as possible, and his intentions fully understood before going into battle, the few requisite evolutions to carry out his views being those selected for frequent exercise, as much will depend upon intelligent co-operation.

I need hardly say that the squadron of swift fleet ships, which should be attached to a fleet, would be stationed to avoid the first conflict, and act as a reserve in support of the line-of-battle fleet where most hardly pressed. This squadron would bring on an action by engaging the stern-most ships of an enemy's fleet striving to escape, and also secure the capture of the retreating ships of a defeated foe.

With these few observations I leave the question of fleet tactics alone, and will confine my remarks to the use of guns in fleet actions, considered under different conditions of attack and defence. No change which may be made as regards the disposition of armour-plating, whether as side armour or as deck armour, or for bow and stern and gun defence, will lessen the importance of the most powerful guns forming the prominent feature in the armament of ships of the line. The value of armour-plating, wherever applied, will still be in relation to its measure of resistance to the penetrating power of the gun which can be opposed to it. The superior power of the gun has become so decided, that armour-plating is now only serviceable for deflecting missiles striking at acute angles of

inclination, or for the protection of guns mounted in barbette towers, where great thickness can be applied. The more powerful the gun, the greater will be the destruction caused by shell bursting in-board,<sup>1</sup> and it is quite probable that the next fearful inroad on the vitality of ships will be effected by shell containing some more destructive material than powder. As between double and single barrelled barbette towers, the choice will lie between the thicker or thinner protective armour. I should therefore have no hesitation in giving the preference to a cone-shaped tower with impenetrable armour and the single gun, over the double-barrelled tower, more liable to be penetrated. There is no doubt that next to the torpedo and the ram in fleet actions, the gun will assert a very prominent part in the result of naval battles, and that in single actions it will be the predominating weapon of offence, and therefore the gun should be developed to its greatest perfection and power in the aggressive properties of ships of the line, consistent with moderate displacement, which is an essential element of handiness. It is not my intention to trespass on the domain of scientific gun manufacture, but the naval gunner is greatly concerned with the choice of weapons, and it is an erroneous theory, which we appear to have adopted, that the weight of gun should be regulated by the thickness of armour-plating which a ship can carry, for it might as well be said that an unarmoured ship should carry no guns at all.

The best arrangement in point of position for placing guns, and the best distribution of armour-plating for safety in battle, are questions of practical importance for the consideration of naval officers, as the gradual increase of gun power has been the cause of constant changes in the adaptation of armour for purposes of safety. But so long as this mode of protection continues, the advantage of superiority in armour-penetrating gun power cannot fail to meet its reward.

From one cause and another the navy of this country has

<sup>1</sup> Shell-firing will cause more damage in passing through penetrable armour than through a raft-bodied ship.



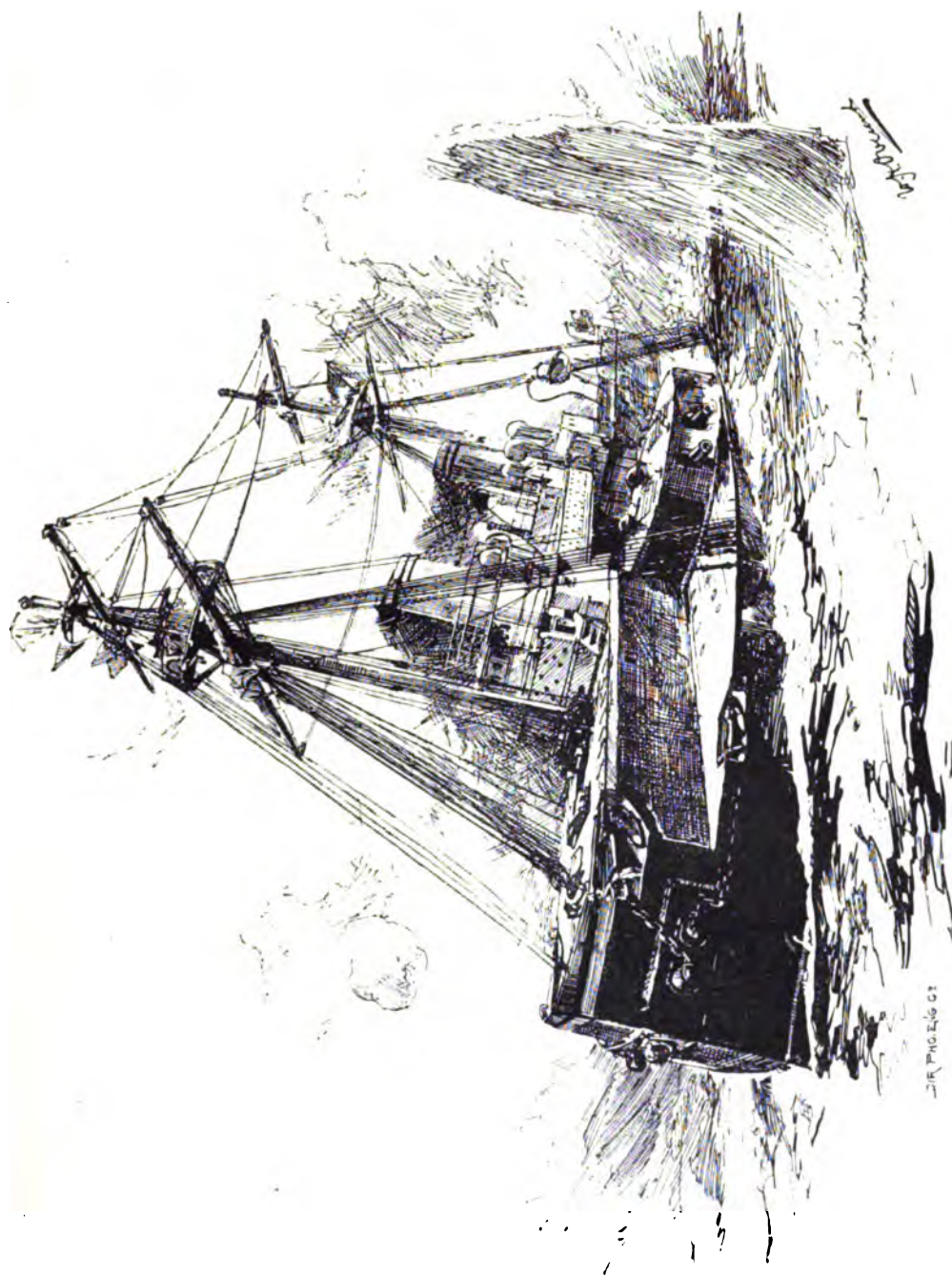


PLATE XI.

SHIP OF "INFLEXIBLE" TYPE HEELING OVER AFTER ARMOUR PLATING IS DRIVEN IN BY A DIRECT HIT AT THE WATER-LINE BELT, ENGINE-ROOM COMPARTMENT.

[To face p. 30]



unfortunately fallen behind other nations in comparative strength of guns and armour, even in vessels of nearly equal displacement, as Admiral of the Fleet, Sir Thomas Symonds, has lately made conspicuous by a table of great value, which follows, and which displays a lamentable weakness in gun fighting power of our latest ships, which must militate against that naval supremacy of which we boast.

TABLE A.

NAMES. i. Italian ; f. French ; e. English.	Thickest armour.	GUNS.			
		Heaviest.	Breech- loaders.	Muzzle- loaders.	Number.
		Tons.			
i. Dandolo . . .	22	100		M.L.	4
i. Duilio . . .	22	100		M.L.	4
{ f. Admiral Duperré . . .	22	48	B.L.		4
{ e. Colossus . . .	18	43	B.L.		4
{ f. Admiral Baudin . . .	22	100	B.L.		3
{ e. Inflexible . . .	24	80		M.L.	4
{ f. Dévastation . . .	15	48	B.L.		4
{ e. Conqueror . . .	12	43	B.L.		2
{ f. Foudroyant . . .	15	48	B.L.		4
{ e. Agamemnon . . .	18	38		M.L.	4
{ f. Indomptable . . .	20	72	B.L.		2
{ e. Ajax . . .	18	38		M.L.	4
{ f. Terrible . . .	20	72	B.L.		2
{ e. Thunderer . . .	12	38		M.L.	4
{ f. Caiman . . .	20	72	B.L.		2
{ e. Dreadnought . . .	14	38		M.L.	4
{ f. Furieux . . .	20	72	B.L.		2
{ e. Neptune . . .	12	38		M.L.	4
{ f. Fulminant . . .	13	38	B.L.		2
{ e. Devastation . . .	12	35		M.L.	4
{ f. Tonnerre . . .	13	38	B.L.		2
{ e. Alexandra . . .	12	25		M.L.	2
{ f. Tonnant . . .	18	48	B.L.		2
{ e. Téméraire . . .	11	25		M.L.	4
{ f. Vengeur . . .	13	48	B.L.		2
{ e. Orion . . .	12	25		M.L.	4
{ f. Tempête . . .	12	20	B.L.		2
{ e. Belleisle . . .	12	25		M.L.	4

The feature, however, most to be regretted in the condition of our fleet lies in its numerical inferiority in ships and torpedo

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vessels as compared with the navies of Europe; and it is much to be feared that so long as the Treasury holds the reins of Neptune's car, and party expediency overrules all sense of danger, no better prospect awaits us than some such fearful national disaster and humiliation as that which befell the French at Sedan owing to the neglect of their armaments. I have, however, to take things as they are, and turn my attention to those gunnery tactics which will affect naval battles in the future. These tactics will no longer be displayed in laying a ship alongside an enemy yard-arm to yard-arm, and fighting it out by independent and continuous quick firing, as in days of yore. Expert gunnery will depend upon a far more studied and skilful distribution of shot and shell, precision of aim contributing most to success. However, so many novel features are involved in the attempt to define any precise rules for the most efficient exercise of gun power in fleet actions, that I can hardly expect my observations will meet with general concurrence of opinion, but I hope they may at least bear the character of being practical.

In fleet actions ships will seldom lie broadside to broadside long enough to reload the guns. A passing exchange of fire will probably be all that will be possible, therefore it will be most important that the gun fire should be accurately and skilfully delivered, and the question arises, how best can that be done? The object sought for should certainly be to strike the most vulnerable parts, and for this purpose it will be essential that those who lay the guns and hold the triggers should be well acquainted with the structural appearance of the ships of the enemy. Therefore facsimiles of their ships should be displayed about the decks of our war ships, so that the crews should become familiarized with their peculiarities, and great care should be taken that our own ships should be easily recognized by unmistakable marks of distinction before going into battle. English ships greatly differ in contour from one another, as we have been continually adopting new types, but the French, with their national instinct for classification, have

laid down simultaneously many ships after the same design, and therefore they would be more easily recognized in the smoke and hurry of fleet actions. In the new order of things, where ships will intermingle, and their movements be rapid and uncertain in the scrimmage of battle, the danger of random firing will have to be strictly impressed on our gunners, as friendly ships may be in the line of fire.

In night actions, conspicuous lights will have to be resorted to. It is well to consider how far the electric light can be rendered useful. It appears to me that where opposing forces are both resorting to this mode of discovery, it will produce a blinding effect all round, and lead to no advantage, and may prove mischievous.

Then comes the question, what part of a ship should it be the aim of our gunners to strike? Should it be the water-line belt, or the gun batteries, or the unarmoured parts? Should they depress their guns for the water line—or aim to cripple the guns—or so as to make an inlet for water into the unarmoured ends? Should the guns converge, and should they be fired by the trigger or by electricity? Should it be independent sight-firing, or firing from the conning-tower? Again, should the bow fire be opened as the fleets approach, or should the fire be reserved until they close? Again, should the lighter guns fire shot, or shrapnel, or shell, and should they do so at the unprotected ends or at the port holes? Surely these questions are capable of being brought into conformity with practical science, if carefully considered in relation to the defensive properties of ships, and they should form the basis of gunnery instruction. I will endeavour to the best of my judgment to throw some light on some of these subjects; but as ships of all nations vary so greatly in their defensive powers, and as the comparative superiority of guns and armour cannot in each case be foreseen, it is only possible to suggest broad rules of expediency for general guidance.

In the belted ship, the water line will probably be found the most vulnerable part, and the engine-room compartment, which,

on account of its unavoidable large proportions, is the danger point of buoyancy. Therefore, if the belt armour is known to be penetrable at short ranges by the gun employed, that locality will present an inviting target for the gunners, especially at close quarters, with beam fire, and still more so if rolling motion should favour the occasion by exposing the hull below water line. Side armour will certainly invite this attack, owing to the superiority of the gun being now established (*vide* Table B);

TABLE B.  
RIFLED BREECH-LOADING GUNS. PENETRATION OF COMPOUND ARMOUR.

Guns.	Weight.	Projectile.	Bursting Charge Common Shell.	Penetration Compound Armour, 1000 yards.
inches. 17	tons. 100	lbs. 2005	lbs. 78	inches. 24
15	63	1700	50	25
13·5	63	1250	40	22
12	43	714	30	18
10	26	500	20	16½
9·2	18	320	15	13
8	12	180	12	10
6	cwt. 80	100	6¼	8
5	34	50	3	—
4	22	25	1½	—

but with a raft-bodied water-line protection and a stout submerged armour-plated deck fore and aft the ship, the danger of a large inlet of water at the water line would be greatly reduced, and then the barbette towers, if penetrable, would be a more inviting target with the object of crippling the guns. These observations refer to the use of armour-piercing guns firing on

the beam in close action, but the same remarks hold good with respect to bow fire at weakly protected ends, especially where the submerged armoured deck is depressed towards the stem, which structural feature is no doubt intended as a support to the spur, with the object of deflecting shot entering low down when the bow is raised out of water in a sea way. But to my mind, this deck sloping downwards towards the spur creates an element of weakness, both as regards the ram and end-on gun attack; because the bow structure above this deck is enfeebled, and because it facilitates penetration by depressed bow fire at close quarters. Whereas, if the horizontal submerged deck is continued to the stem without drooping, and if it forms the projecting feature of the stem, and the bow is armour-plated below and above this deck, raking shot would be deflected and greater structural strength would be afforded at the point where the ram blow is delivered. Some damage must always be expected at the bows from end-on fire, and from ramming, however well fortified. But to prevent any large admission of water into buoyancy spaces at the bows below the armoured deck, the lower compartments should be filled with cork, thus reducing the danger of a ship being brought down by the head and rendered unmanageable.

Apart from the question of armour-piercing guns, which, in order to be effective, should be of the greatest penetrating power, guns of light calibre and machine guns will take an active part in fleet actions, both as a defence against torpedo vessels, and by being directed against the guns and gunners of the enemy. The number of these lighter weapons might with great advantage be increased in the armament of the war ships of the British navy, and as these batteries cannot be protected by armour, and as it must be expected that the disablement of guns' crews will be greater than heretofore, it is evident that unless the present establishment of seamen gunners is considerably increased, reliefs would not be forthcoming, and the guns would soon be silenced. I venture to offer the opinion that some effort should be made to afford shelter to the guns' crews

on the light-gun battery deck, where they could lie down after loading the guns, which might be fired by electricity whilst passing an enemy in the line of battle. Sufficient armoured shelter might be provided in midships to protect the gunners against machine-gun fire, if not against shell-fire from rifle guns of light calibre.

With regard to delivering whole broadsides simultaneously from the conning-tower by electricity in fleet actions, this mode of directing gun fire might be advantageously resorted to with armour-piercing guns depressed so as to search the vitals when ships are passing each other in close order, and when timely arrangements can be made; but otherwise, looking to the vicissitudes of fleet actions, and to the suddenness with which opportunities for the gun attack may present themselves, and to the probable disarrangement of electric apparatus, I should be disposed to leave each battery to its own resources for expert firing, guided by previous precautionary instructions, and such other assistance as can be conveyed from the conning-tower during the fight.

I reckon that torpedo fire must be directed from the conning-tower, and that, as regards the six-inch guns and machine guns, they must be left to their own devices, such open spaces as the conning-towers, and barbette towers, and port holes, attracting their chief attention when not concentrated upon their natural opponents of like description, or occupied in attacking torpedo boats.

The safety of the conning-towers is a matter of supreme importance, and their size and form admits of any thickness of armour being applied, which may be necessary to render them perfectly invulnerable. The fate of the ship will depend upon the working order of this centre of control of the scientific arrangements by which the fighting power is directed. It is to be feared that in our navy there is not a conning-tower which is not liable to be knocked to pieces by the first well-directed shot from guns now in existence.

Rudder heads and steering gear are in the same category as



danger points of first instance, which, owing to their small dimensions, are capable of being thoroughly protected by armour-plating; and here again in our ships the defensive power is quite inadequate. I am aware that the whole question involved in the sufficiency of armour protection is that of weight-carrying capacity of ships, and that our naval constructors have been striving their utmost to contend against the ever-increasing power of the gun by the use of vertical armour-plating of increased power of resistance. But they have found that this endeavour has only invited an increased power of gun, and that at last they can do nothing more than obtain a very limited and partial protection by this mode of defence, even in ships of objectionable dimensions. *If my views are correct, that a limit of size of ship is essential for ships intended to fight in line of battle,* it must be evident that some substitute for vertical armour-plating for protection of buoyancy must be resorted to, and that vertical armour-plating must be abandoned, except over very limited spaces such as I have referred to, and where it can be so applied as to afford more efficient protection. A penetrable water-line belt of armour is, to my mind, a most unwise expedient, as an armour-plate driven in would make a gaping aperture, which would at once disable a ship; but a cellular or raft body built upon a submerged armour-plated deck might be riddled very considerably without vital consequences ensuing, because damages would admit of being more easily repaired. That the gun must eventually beat the armour was long ago foreseen, but we have continued to build ships regardless of any safeguard against the inevitable future. This has resulted in the possession of an obsolete fleet. There is no doubt that the destructive properties of the ram and torpedo point unmistakably to the disadvantage of building unwieldy ships for fleet actions where great speed is not essential; but, by further abandonment of vertical armour-plating, a barbette ship of moderate dimensions would still be capable of mounting the most powerful guns in use, and they could be more efficiently protected than at present. I trust that the remarks I have

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offered on the subject of "Naval Battles of the Future, and how to fight them," under the three heads of torpedo, the ram, and the gun attack and defence, may at least call the attention of our rising officers to the importance of maturing their thoughts on these intricate questions of naval tactics, so that they may be fully prepared when their time comes to uphold the glorious traditions of England's naval history.

## CHAPTER IV.

### THE POSSESSION OF THE SUEZ CANAL IN TIME OF WAR.

IN the *Contemporary Review* for July, 1884, Mr. Henry Dunkley places before us his views of the Egyptian embroilment. This treatise is highly instructive as a defence of our present policy, because as one who is certainly not a hostile critic, he enunciates the grounds upon which alone he considers that policy can be justified. But if it should be made apparent that his premises are at fault, and that they cannot be reconciled with existing facts, then, by his own showing, our present policy must stand condemned. He bases his defence of our aggressive operations in Egypt on strategical grounds of expediency, the conditions of which do not exist except in his own fertile imagination; namely, our *maritime superiority*. He places the present Government on the horns of this dilemma, that either their policy cannot be defended, or that it has been all through, and still remains, their intention to insure the command of the Mediterranean in war time by the naval power of Great Britain. Of this intention, however, they have shown no signs.

Mr. Dunkley offers some very pertinent remarks bearing on the strategical considerations above referred to, and which it will be interesting to examine carefully in their relation to the existing state of our navy.

Speaking of the Suez Canal in peace time, he says:—"All we want is a right of way through it, and a reasonable certitude that this right will not be interfered with. During *peace time* there can be no possible ground for apprehension. A commercial undertaking (and the canal is nothing else) lives on its

profits, and those who own it will never seek to get rid of four-fifths of their customers. They would do their best to keep it open for us in time of war, but they might not have the power." And speaking of *war time*, he says that "Our being able to use the canal would be a question of *maritime superiority*, and that our having or not having a territorial hold on Egypt could make no difference whatever." He explains this by saying, "A difference there no doubt would be if Egypt were in the possession of another power, since the canal might then be obstructed at some point of its course beyond our reach. But if we were *supreme at sea*, Egypt would not long remain in hostile hands, did we think it worth while to wrest it from them."

Now I have quoted these opinions because, coming from an apologist of the policy of the present Government, they recognize the basis upon which alone the expediency of our military intervention can be accepted. They point to the supreme importance of the maintenance of our *maritime superiority*, without which the risks and sacrifices we have made to retain an exclusive hold on Egypt cannot be justified. This inference can fairly be drawn from the context of the above quotations. Therefore, looking to France as our natural rival in Egypt, it is evident that unless it is contemplated that we shall be able to *command the Mediterranean* in the event of war, our interests in Egypt from a strategical point of view cease to exist, and our traditional policy has no longer any standpoint of expediency or justification. In peace time we have nothing to guard against; but in the event of war, unless our naval power is greatly increased, our few ships in the Mediterranean would have to scuttle home as quickly as they could, or run the risk of being locked up in Malta Harbour, or captured by a superior force, whilst our home fleet was guarding the Channel. I shall refer to this view of the case later on, but *en passant*, I cannot agree with Mr. Dunckley that if England could command the Mediterranean "the territorial possession of Egypt by a foreign power could not be retained, did we think it worth while to wrest it from them." A French *corps d'armée* in possession of Egypt would

nowadays laugh at all the armour-clads in the world. It could not be starved out, nor driven out, as easily as in the days of Abercromby and Baird ; nor do I agree with Mr. Dunckley that the interests of the shareholders would in such a case be so far studied as to keep the canal open ; nor could neutral Egypt be relied upon to befriend us in that respect, unless controlled by the presence of a British land force. Mr. Dunckley's views, however, are only intelligible in the light of the wonderful picture he draws of the overpowering strength of the British navy. He must have been dreaming of the history of former wars, when "Britannia ruled the waves," and when her fleet outnumbered and swept the seas of all the navies of Europe combined against her commercial ascendancy. Is such combination possible now ? Where are our allies at the present time ? Mr. Dunckley tells us we have no friends. That is true enough, and I only wish that his picture of our naval power was equally true and correctly drawn. He describes this as follows :—"As a naval power *we dominate every sea !* and threaten every shore ! There is no port where we may not pay an unexpected visit with an ironclad squadron equivalent to a couple of army corps" !! And he believes this, and so do many others, because they are told so by high authority. This language of brag is conventional, and serves its purpose in the atmosphere of Downing Street and Whitehall. But is there an officer in our own fleet, or in the fleets of Europe, who does not know better, who is not aware that to divide our impoverished fleet between the shores of Egypt and the British Channel would be to invite certain destruction to both divisions ? But more of this hereafter.

Mr. Dunckley certainly displays elsewhere some doubts as to the strength of our position when he asks, "Are we prepared at once, or in the near future, to go to war with France?" Again, "At the back of all, there is the question of the adequacy of our resources for the successful waging of a conflict the final proportions of which it would not be easy to fix beforehand." Further, "We are a great nation, and we pay the penalty in having but few friends." Only one answer can

be given to these remarks. This is, that whilst we have been running great risks of provoking a war with France, we are not prepared for such a contest; and that if we have no allies, it is not because we are a great nation, but because of the decrepitude of our naval power and of a foreign policy which has alienated all Europe. It is not for me to enter into a political controversy with such an able writer as Mr. Dunckley; but as a naval officer I may venture to take a strategical view of this Egyptian question with reference to the possession of the Suez Canal in war time. This is the principal object of this chapter, and for this purpose I place maps before my readers showing the positions of the fleets of Europe bordering on the line of communication and their probable movements. By comparing relative forces, it becomes an easy matter to make a forecast of the probable eventualities of war in relation to the Suez Canal route, and to arrive at a fair estimate of the strategic value of a policy depending upon the command of the Mediterranean with the navy we possess. The political and commercial importance of Egypt rests with the power which can command those seas in war time, and statesmen of both parties are agreed upon the paramount importance, for peace or war, of our supremacy over this highway to our eastern possessions. Blinded, however, by political expediency, they have failed to recognize the glaring inconsistency of contending for a strategical position abroad whilst totally neglecting to provide those naval resources by which alone that position can be made available for our use in the event of war with France alone, to say nothing of a combination of Mediterranean powers. This negligence appears the more astounding, when it is perceived that as our national wealth has increased, our commercial interests in the Suez Canal become more extensive, the security of our Indian empire more imperilled, so has the determination not to provide the means of increasing the strength of our navy to proportions adequate to the performance of its extended duties become more marked and persistent. The delusive assertions of responsible ministers as to the numerical superiority of our navy is deserv-

ing of the highest censure. If the eyes of the nation could only be opened to the danger which threatens the loss of our naval supremacy, and the ruin which must inevitably follow our being overpowered at sea, the most severe condemnation would fall upon those political gamesters who barter our national security for party gains. Of late years we have witnessed strange inconsistencies in our foreign policy. In some quarters of the globe we have accepted defeat with dishonour, and have suffered loss of power and prestige, and surrendered British interests in the cause of peace and humanity; whilst in Egypt, under the same guiding influence, we have rushed into war to suppress a national rising of an oppressed and friendly people on the pretext of protecting British interests, which were not threatened, inasmuch as the strategical object in view, if obtained, would have been rendered abortive by the enervating process of starving our naval resources at home. In addition to the great destruction of property, and to the sacrifice of blood and treasure we have caused, we have disregarded the suzerain rights of the Sultan of Turkey, and so alienated the friendship of an old and faithful ally; while we have stirred up the latent jealousy of France, and incurred the risk of reopening the Eastern Question.

It was indeed a strange delusion to suppose that the revolution of Arabi Pasha endangered the freedom of the Suez Canal, or our coveted hold on Egypt. This fallacy Mr. Dunckley has clearly exposed, and the wrong-doing is all the more to be deprecated; as, if the millions of money which this fiasco will have cost us had been expended upon an increase of our fleet, they would have gone far towards securing the command of the Mediterranean. British interests would thereby have been protected in a substantial manner, instead of having been irretrievably sacrificed, and peaceful relations would have been maintained through the legitimate authority of the Sultan. This, it appears, we are now inviting as the only means of getting out of the mess we have got into.

I am aware it is said that we were bound to support the

ruler of Egypt, and protect life and property; but Arabi threatened neither the Khedive nor the Europeans, nor the bondholders' interests. On the contrary, he undertook to protect them. It was his interest to do so, and he held the power in his hands. Arabi the revolutionist wanted to make a puppet of the Khedive, and to free the people from the oppression of the pashas. Our present Cabinet has had the same object in view!

The use made of our fleet for this purpose was a gross blunder. We *demonstrated*. The demonstration failed. Arabi rose to the occasion, and mounted guns as a *counter demonstration*, and thus offered insult for insult. Then we took the huff!

It has been said that our influence in the valley of the Nile and our prestige in the East was endangered. But our hostile action was the best way to destroy both, and it has done so irrevocably. Had we wanted to annex Egypt, our conduct would have been intelligible and consistent by challenging an affront. But having no such intention, our policy should have been to create no animosity, and to have tendered good offices all round. As it is, whenever we are enabled to get out of our present unfortunate position, we shall have gained nothing in power, or prestige, or commercial advantage, but shall have left behind us a legacy of blood and ruin, and a score of hatred amongst races who do not forget an injury, should the occasion ever arise when friendly neutrality might be of great service.

If, by putting down the rebellion of Arabi Pasha, England had obtained such an advantage as a concession for a second canal, such a benefit to our commerce might have condoned our action, if it could not justify the means employed. But having challenged the displeasure of Europe, we took fright at her frowns, and promised to come out empty-handed—in fact, a considerable loser in every sense of the word. A noble example of disinterestedness, almost equal to our scuttling out of the Transvaal and quietly submitting to the aggressive acts of France and Russia in other quarters of the world, where our interests have been assailed.



We were bound in honour to relieve General Gordon at any cost. This came to be perceived at last, and having destroyed the Egyptian army and crippled its resources, we are also bound to protect Egypt for the time being. But we must look at home for the means of becoming masters of the Suez Canal should war arise, by raising our navy without loss of time to double its present numerical strength; and then, whatever may be the state of Egypt, we shall at least have it in our power to hold *the keys of the doors of the Suez Canal* against all our enemies. The strong man armed keepeth his house safe, and although a blundering foreign policy has stirred up strife abroad, and created enmity, yet it is mainly owing to our having of late years neglected to maintain our naval supremacy that the cupidity of France and Russia has been excited, and that our natural allies stand aloof from us. The dangers which threaten our empire are daily increasing, and yet no sign is perceived that our present rulers recognize the great peril which awaits us, owing to the weakness of our navy. It is not possible rapidly to increase our armour-clad fleet, but every effort should be made in that direction, and also to provide an adequate number of armed cruisers for the protection of our food supply and our commerce. The introduction of torpedo vessels as a prominent feature of naval warfare offers the speediest mode of adding to the strength of our fleet, and at least 100 of such craft might be completed within a twelvemonth. Fifty of these destructive weapons of offence, with the same number of gunboats distributed round our coasts, would render us comparatively safe at home against any aggressive acts by the ships of an enemy; they would also give our sea-going fleet more freedom of action, and fifty more of them attached to the fleet would greatly compensate for our weakness in other respects. An additional five millions of money added to the estimates for ship-building for the next four or five years would go far towards the recovery of our lost supremacy, and provide a better security for peaceful relations than all the intrigues of diplomacy, than any number of conferences, or any policy of surrender, however

extended that might be. It must be remembered that the coasts of England and her colonies are far more extensive and more vulnerable than those of other nations, and as their defences are greatly superior to ours, their fleets would be more at liberty to leave their shores. Steam power and the telegraph wire would greatly facilitate concentrated movements for combined attack on a weaker force, and any attempt at an efficient blockade of an enemy's ports would, in these days, be an act of folly. To attack fortified places with armour-clads would result in nothing but disaster. This would have happened at Alexandria, if the forts had been of modern construction, the guns more powerful, and the gunners skilled and courageous.

I have before now advanced the opinion that, in the event of war with France alone, in the present condition of our navy and coast defences, and after strengthening our squadrons abroad, the whole fleet of England would be required for the defence of the Channel; further, that any idea of commanding the Mediterranean waters must be abandoned. On this point I have consulted many able officers, and have received but one answer, namely, that to divide the fleet we possess, which is only numerically equal to that of France, between the Mediterranean and the Channel, would be to invite certain defeat. A glance at the maps accompanying this article will enable any civilian to decide this question for himself.

It is only natural to suppose that the French fleets would be divided between the ports of Cherbourg, Brest, and Toulon. Could we dare to divide our fleet, leaving the Brest and Toulon fleets between our two divisions, so that they could unite and attack us in detail? No. In order to use the Suez Canal route in war time, England must make up her mind to restore her naval power to such dimensions as will enable her to afford adequate protection to our shores and to our colonies, and at the same time to command the Mediterranean and the Red Sea; otherwise it is not improbable that this road to the East may become more useful for the war ships of our enemies than to our own. Can we rely upon the neutrality of other naval powers in the event of a war between England and France? Is it at



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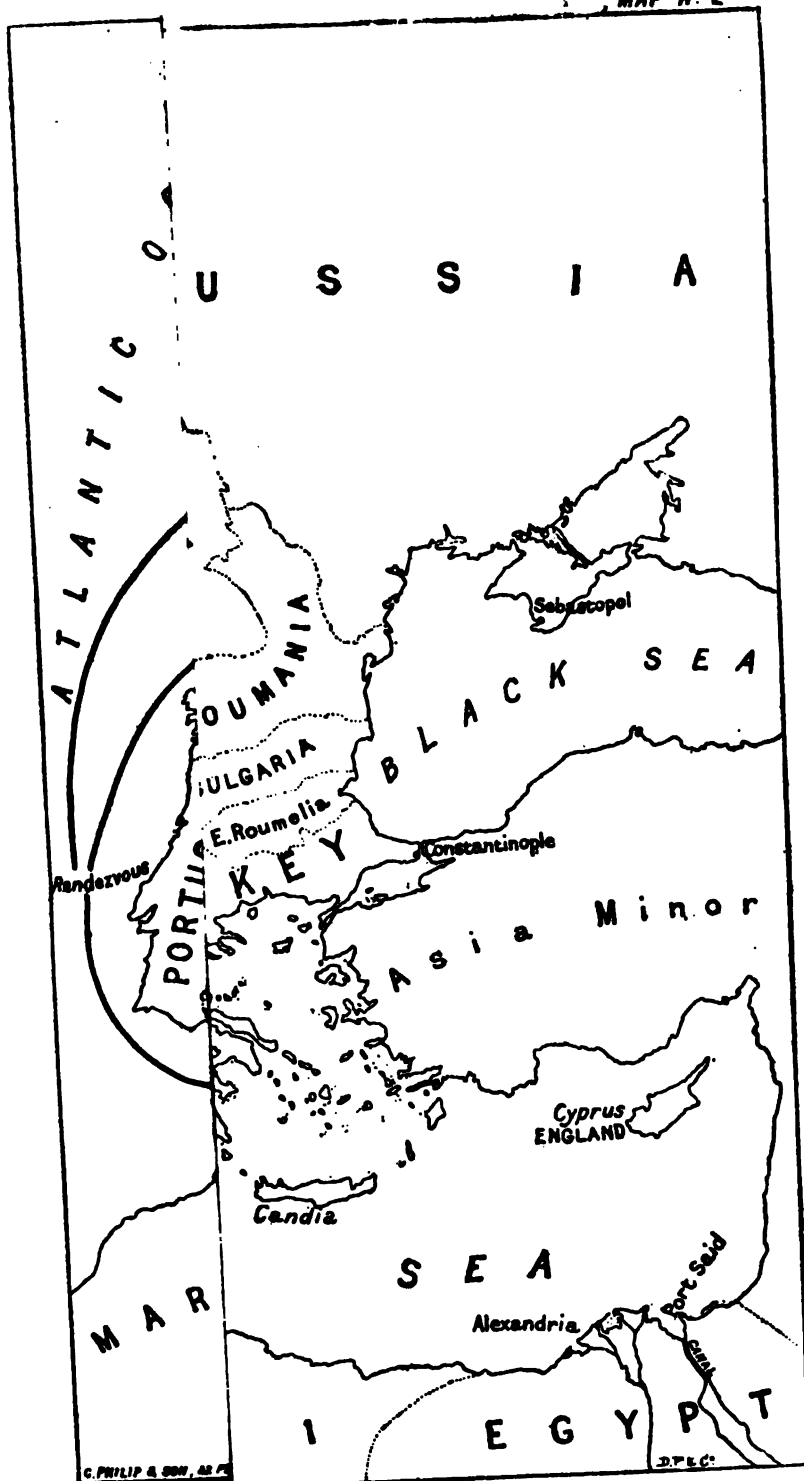
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ALGERIA  
(FRANCE)

MARCO

The map shows the location of the French Algerian coast and the Mediterranean Sea.



G. PHILIP & SON, 42 F.

D.P.C.

on the Channel.

[To face p. 44.



all likely, in the present state of Europe, that there would be no combination against us? Would Russia lose such an opportunity of striking a blow at her old enemy?<sup>1</sup> Have the present Government's friendly relations in that quarter resulted in anything but one-sided advantages? Under the present *régime*, would the Sultan of Turkey refuse the passage through the Dardanelles to the Russian Black Sea fleet, out of regard for the friendship he bears our present Cabinet? Would Germany interfere to prevent a war between England as against France, or France and Russia combined? No; "not a Pomeranian soldier." And would Egypt refuse the use of the canal to our enemies under pressure, and out of gratitude to England for past favours? These questions suggest probabilities of danger which are extremely alarming, and point forcibly to the providence that is displayed in the existing weak state of our naval forces—a condition which, except within the confines of Downing Street, is looked upon as the height of recklessness, emanating as it does from a perversion of traditional statesmanship, the worship of Mammon, and dreams of universal brotherhood.

The fact stares us in the face, that by starving our navy we have shut ourselves out of the Suez Canal in war time, because we can no longer hold its approaches. Unless we reverse our policy of inactivity and stinginess, and carry out a well-organized defence of our coasts and a large increase of our sea-going fleet, the Mediterranean itself will become a closed lake to England. Malta and Gibraltar would be in danger of being starved out, a result in which Spain and Italy might take a lively interest. The present Government has referred to the Cape of Good Hope route as affording a means of communication with India, only less advantageous by the delay of a fortnight to that of the Suez Canal. But there are some serious drawbacks, beyond that of delay and the risk of stormy weather, to this mode of disposing of an inconvenient question. These are, that the mercantile marine which now navigates the canal is not adapted for the longer voyage round

<sup>1</sup> This chapter was written before the present embroilment with Russia on the Afghan frontier.

the Cape, and that an enemy's cruisers would have more ample opportunity of intercepting our merchant ships over the longer passage. Further, that convoying could not be so easily effected as in the Mediterranean.

The remarks I have offered on this subject are not intended in any way to depreciate the value of the Suez Canal route to our empire in the East in war time; far from that, seeing that Russia has closed up on the north-west frontier of Hindostan, and that France has taken up a threatening attitude contiguous to the south-east frontier, the importance of the command of the highway by the Suez Canal to the East is greater than ever. But I have desired to render as conspicuous as possible the folly of exhausting our resources and running the risk of war by contending for pre-eminence in Egypt—in fact, by grasping at a shadow, whilst totally ignoring our inability to possess the substance in time of need. I consider that to uphold our traditional policy in Egypt is more important to our imperial interests than ever. We are only rendering ourselves ridiculous before Europe by the contradictory policy we have pursued with regard to maintaining the necessary power so as to utilize the possession we covet. On the one side the cry is heard, "Give us Egypt"—"Give us the Nile"—"Make us masters of the Suez Canal"—and at the same time equally loud and persistent is the cry of "Reduce the navy estimates." Let this rivalry of political economists at home over our naval expenditure cease, and let us prove equal to the imperative demand of maintaining our maritime supremacy. Instead of husbanding resources of wealth, which invite the cupidity of foreign powers, and which, should a war break out, could not be utilized in time to add one war ship to our navy, let us boldly assert our claim to command the seas, not for purposes of aggression, but for the security of our national existence. Lord Northbrook, the First Lord of the Admiralty, has lately traversed the route to Egypt. In so doing, have his thoughts turned to the consideration of any possible distribution of the naval forces he commands, such as could be relied upon



to secure to us the use of the Suez Canal in the event of war with one or more of the Mediterranean powers? Did he cast his eye at the strategical positions of the French fleets at Cherbourg, Brest, and Toulon? Did any thought occur to him of the unprotected state of our coasts? If his attention has been called to these great emergencies whilst away from the atmosphere of Downing Street, it may be hoped that the grave sense of the responsibility he bears may have produced on his mind a clearer estimate of the impotence of our position to hold Egypt. Further, that an equality of naval power between France and England may not appear to him quite so satisfactory a state of security as that which he lately announced in Parliament.

The senior Naval Lord of the Admiralty, at the last annual meeting of the Royal United Service Institution, stated that the Board had been occupied for the last two years with the *consideration* of the *material* and *personnel* of the navy, its disposal in the event of war, and how it was to be rendered most efficient. What a relief from unpleasant embarrassment is found in these words *under consideration*! However, as the navy estimates have not been adequately increased, the only inference which can be drawn from the above information is, that the naval members of the Board consider our national defences to be in a satisfactory condition, and that our naval expenditure is sufficient to insure our safety; otherwise it may be taken for granted that, looking to the very responsible position they hold before their country as naval advisers of the Government, they would not retain office for a single day. All that need be said is, that the confidence thus displayed in the existing strength and growth of our navy is irreconcilable with facts shown below, by extracts from an article recently published in the *Engineer*. Some of the loudest voices of alarm which have been raised *have come from ex-officials of the Admiralty*: Admirals Sir Spencer Robinson, Sir W. Houston Stewart, late controller of the navy, and from Sir Edward Reed, late chief constructor, and Lord Henry Lennox, late secretary.

It is from no light cause that this cry of danger to our

empire has been forced from these experienced men, and from the Admiral of the Fleet, Sir Thomas Symonds, from Admiral Sir Edward Fanshawe, and from many others. Their warning words have been re-echoed throughout the whole naval service. Thus to expose our weakness has been a painful duty, and has arisen solely from a deep sense of patriotism, and as the only means of bringing home to the minds of a deluded public the full sense of the great peril which awaits our empire in presence of the overpowering navies of Europe.

To suppose that the neutralization of the Suez Canal will secure its use to belligerents in war time is simply a delusion, seeing that whichever naval power can command its approaches will hold the keys of the position against all enemy's ships.

#### EXTRACTS FROM THE "ENGINEER."

"Modern line-of-battle ships with an armament not less effective than a Woolwich 9-inch *breech-loading gun*, and armour equal in resisting power to 12-inch rolled iron plates:—

#### BRITISH FLEET.

	Armour. in.	Guns.
Alexandra . . .	12 . . .	2 11-in. ; 10 10-in.
Superb . . .	12 . . .	16 11-in.
Belleisle . . .	12 . . .	4 12-in.
Orion . . .	12 . . .	4 12-in.
*Hotspur . . .	11 . . .	2 12-in. ; 2 6-in.
Glatton . . .	14 . . .	2 12-in.
Devastation . . .	14 . . .	4 12-in.
Thunderer . . .	14 . . .	4 12½-in.
Rupert . . .	14 . . .	2 9-in. ; 2 6-in.
Neptune . . .	13 . . .	4 12½-in. ; 2 9-in.
Dreadnought . . .	14 . . .	4 12½-in.
*Inflexible . . .	24 . . .	4 16-in.
*Ajax . . .	18 . . .	4 12½-in. ; 2 6-in.
*Agamemnon . . .	18 . . .	4 12½-in. ; 2 6-in.
Conqueror . . .	12 . . .	2 12-in. ; 2 6-in.
*Colossus . . .	18 . . .	2 12-in. ; 5 6-in.
*Edinburgh . . .	18 . . .	2 12-in. ; 5 6-in.
*Collingwood . . .	18 . . .	4 12-in. ; 6 6-in.

POSSESSION OF THE SUEZ CANAL IN TIME OF WAR. 51

BRITISH FLEET—(continued).

	Armour. in.	Guns.
*Rodney . . .	18 . . .	4 13½-in. ; 6 6-in.
*Howe . . .	18 . . .	4 13½-in. ; 6 6-in.
*Anson . . .	18 . . .	4 13½-in. ; 6 6-in.
*Camperdown . .	18 . . .	4 13½-in. ; 6 6-in.
*Benbow . . .	18 . . .	2 18-in
*Impérieuse . . .	10 . . .	4 9-in. 6 6-in.
*Warspite . . .	10 . . .	4 9-in. ; 6 6-in.

N.B.—Vessels marked thus (\*) are plated with compound armour.

FRENCH FLEET.

	Armour. in.	Guns.
Redoubtable . .	13½ . .	8 10½-in. ; 6 5½-in.
*Dévastation . .	15 . .	4 13½-in. ; 2 10½-in. ; 6 5-in.
*Furieux . . .	13½ . .	2 13½-in. ; 4 4-in.
*Tonnerre . . .	13½ . .	2 10½-in. ; 4 4½-in.
Fulminant . . .	13½ . .	2 10½-in. ; 4 4½-in.
Tempête . . .	13 . .	2 13½-in.
Terrible . . .	19½ . .	2 16½-in. ; 4 4-in.
*Requin . . .	19½ . .	2 16½-in. ; 4 4-in.
Vengeur . . .	13 . .	2 13½-in.
Foudroyant . .	15 . .	4 13½-in. ; 2 10½-in. ; 6 5½-in.
Tonnant . . .	17½ . .	2 13½-in.
*Baudin . . .	21½ . .	3 14½-in. ; 12 5½-in.
*Indomptable . .	19½ . .	2 16½-in. ; 4 4-in.
*Duperré . . .	21½ . .	4 13½-in. ; 14 5½-in.
*Vauban . . .	10 . .	4 9½-in. ; 3 7½-in. ; 6 5½-in.
*Caiman . . .	19½ . .	2 13½-in. ; 4 4-in.
*Marceau . . .	17½ . .	2 13½-in. ; 2 10½-in. ; 16 5½-in.
*Hoche . . .	17½ . .	3 13½-in. ; 18 5½-in.
*Majenta . . .	17½ . .	2 13½-in. ; 2 10½-in. ; 16 5½-in.
*Neptune . . .	17½ . .	2 13½-in. ; 2 10½-in. ; 16 5½-in.
*Charles Martel .	17½ . .	4 13½-in. ; 8 5½-in.
*Brennus . . .	17½ . .	4 13½-in. ; 8 5½-in.
*Formidable . .	21½ . .	3 14½-in. ; 12 5½-in.
*Bayard . . .	10 . .	4 9½-in. ; 2 7½-in. ; 6 5½-in.
*Duguesclin . .	10 . .	4 9½-in. ; 2 7½-in. ; 6 5½-in.

N.B.—Vessels marked thus (\*) are plated with compound armour.

“Ships protected by armour equal in power of resistance to at least 6-inch rolled iron plates, and sufficiently heavily armed to cope successfully with any of the most powerful foreign unarmoured cruisers :—

## BRITISH FLEET.

	Armour. in.	Guns.
Temeraire . . .	11 .	4 12-in. ; 4 10-in.
Monarch . . .	10 .	4 12-in. ; 2 9-in. ; 1 7-in.
Hercules . . .	9 .	8 9-in. ; 6 6-in. ; 6 4-in.
Sultan . . .	9 .	8 9-in. ; 4 8-in. ; 7 4-in.
Shannon . . .	9 .	2 10-in. ; 7 9-in.
Nelson . . .	9 .	4 10-in. ; 8 9-in.
Northampton . .	9 .	4 10-in. ; 8 9-in.
Audacious . . .	8 .	10 9-in. ; 8 4-in.
Invincible . . .	8 .	10 9-in. ; 4 4-in.
Iron Duke . . .	8 .	10 9-in. ; 4 6-in.
Triumph . . .	8 .	10 8-in. ; 8 4-in.
Swiftsure . . .	8 .	10 9-in. ; 8 4-in.
Bellerophon . . .	6 .	10 8-in. ; 2 6-in. ; 4 4-in.
Repulse . . .	6 .	12 8-in.
Penelope . . .	6 .	8 8-in. ; 3 4½-in.

## FRENCH FLEET.

	Armour. in.	Guns.
Turenne . . .	10 .	4 9½-in. ; 2 7½-in. ; 6 5½-in.
Friedland . . .	8½ .	8 10½-in. ; 8 5½-in.
Richelieu . . .	8½ .	6 10½-in. ; 6 9½-in. ; 10 4½-in.
Colbert . . .	8½ .	8 10½-in. ; 2 9½-in. ; 4 5½-in.
Trident . . .	8½ .	8 10½-in. ; 2 9½-in. ; 4 5½-in.
Océan . . .	7½ .	4 10½-in. ; 4 9½-in. ; 10 4½-in.
Marengo . . .	7½ .	4 10½-in. ; 4 9½-in. ; 10 4½-in.
Suffren . . .	7½ .	4 10½-in. ; 4 9½-in. ; 10 4½-in.
La Gallissonnière	6 .	4 10½-in. ; 4 9½-in. ; 10 4½-in.
Victorieuse . . .	6 .	6 9½-in. ; 4 4½-in.
Triomphante . . .	6 .	6 9½-in. ; 1 7½-in. ; 6 5½-in.
Belliqueuse . . .	6 .	6 9½-in. ; 1 7½-in. ; 6 5½-in.
Alma . . .	6 .	7 7½-in. ; 4 4½-in.
Atalante . . .	6 .	7 7½-in. ; 4 4½-in.
Thétis . . .	6 .	6 6½-in. ; 4 4½-in.
Montcalm . . .	6 .	6 6½-in. ; 4 4½-in.
Reine Blanche . .	6 .	6 6½-in. ; 4 4½-in.

“It is hardly necessary to enumerate the ironclads of the third class; suffice it, therefore, to observe that Great Britain has fourteen, and France nine such vessels. There now remain only the ships for coast defence, of which class the British navy includes seven, viz. the *Hecate* and her three sister ships,

and the *Prince Albert*, *Scorpion*, and *Wyvern*. Of these, the *Hecate* and her consorts only are worthy of notice; they each mount four 10-inch guns, and are protected by 10-inch armour.

"France has always devoted special attention to the defence of her coasts, and her navy at present includes nineteen vessels designed for this purpose, viz. eleven afloat and eight building. The most important of the former are those of the *Bélier* type, mounting two 9½-inch guns, and plated with 8½-inch armour. The eight vessels now building are small armoured torpedo rams, and are representatives of the same class, though those of the *Achéron* type are somewhat larger than the *Fusée* and her sister ships, viz. 1639 tons, instead of 1045 tons. They are plated with 9½-inch modern armour, and are expected to steam at a mean speed of thirteen and fourteen knots respectively. The *Achéron* will mount a 9½-inch gun in a revolving turret, and two 4-inch guns, whilst the *Fusée* will carry a 9½-inch gun *en barbette*, and a 3-inch gun. These vessels will likewise be provided with under-water torpedo tubes.

"This brings us to the close of our review, from which it will be seen that the relative numerical strength of the British and French navies is as follows :—

1st class ironclads . .	England, 25 . .	France, 25
2nd       " . .	" 15 . .	" 17
3rd       " . .	" 14 . .	" 9
Coast defenders . .	" 7 . .	" 19
Total number of ironclads . .	" 61 . .	" 70

#### REFERENCES TO MAPS.

MAP No. 1.—Shows the Suez Canal route with the strategical positions of the different navies of Europe and their coaling depôts.

MAP No. 2.—Shows the strategical position of the French fleet divided between Cherbourg, Brest, and Toulon, with ten effective battle ships at the two latter ports and five at the former. Also of the English fleet divided between Portsmouth, Portland, and

the Mediterranean, with ten effective battle ships at the two latter ports and five at the former to watch Cherbourg. The two French divisions at Brest and Toulon could unite off the coast of Portugal in order to make a combined attack on the Channel fleet at Portland—twenty ships against ten ! or, counting the Cherbourg and Portsmouth ships, twenty-five against fifteen !

MAP No. 3.—Shows the respective fleets divided as in No. 2 Map meeting off Gibraltar to make a combined attack on the British Mediterranean fleet wherever found—twenty ships against ten !

NOTE.—It must be estimated that, counting ships built and building, England and France will shortly be able to put to sea, on the outbreak of war, an equal number of effective line-of-battle ships. That number is stated to be twenty-five. The comparative strength of *obsolete* armour-clads is not taken into account. England's superiority, if any, in this respect may be set off against her greater need for ships for colonial and coast defence. This comparative equality is unfortunately more favourable to France than would appear, inasmuch as nineteen of the English first-class ironclads are mostly only armoured one-third the length of their water line, which is a serious defect, and the French have also a great superiority in breech-loading guns. It is taken for granted that if any English fleet were sent to the Mediterranean, it would have to be of equal strength to the French fleet at Toulon ; but, should the *combined* fleet of France ever get between the divided fleet of England, it is difficult to see how a grave disaster could be avoided. Any attempt to blockade Brest and Toulon could not be relied upon. Such attempt would be a dangerous expedient. To divide the English Mediterranean fleet between Gibraltar and Malta, Cyprus, or Port Said, for the protection of the Suez Canal route would only make matters worse. With equal forces at sea, France would command the Mediterranean in the event of war with England single-handed, and therefore possess the Suez Canal.

## CHAPTER V.

## ENGLAND'S EXPOSED POSITION.

## PART I.—HOME DEFENCES.

THE poverty of our imperial defences has lately been treated in a most skilful and comprehensive manner by Sir Charles Nugent, K.C.B., R.E., in a lecture read at the Royal United Service Institution, and published in the journal of that society.

Some of our most experienced naval and military officers took part in the discussion, which lasted over three meetings, and it would hardly be possible to frame a committee of experts more competent to enunciate sound opinions. At the present time, when public attention is engrossed with the alarming truths about the inefficient state of our First Line of Defence, it is most desirable that the vulnerability of our coast should be as fully exposed as possible. I will therefore endeavour to summarize the opinions of those distinguished authorities who have devoted their attention to this subject, and to supplement their recommendations by entering more fully than they have done into the question of "flotilla" for coast and harbour defence. Putting aside the question of our territorial army, our empire relies for the defence of its littoral on the following combined powers of resistance. *First*, on our naval supremacy; *secondly*, on coast-defence vessels of the monitor type; *thirdly*, on harbour, flotilla, gun and torpedo boats; and *fourthly*, on land fortifications and submarine mining, and floating obstructions on the water surface. In what position, then, do we stand with regard to these powers of self-preservation? The weakness of our *first line of defence* is of world-wide notoriety, but even supposing that our

sea-going fleet were double its present strength, it could not, as in days of yore, be relied upon to safeguard all our coasts. The enormously increased duties which our navy would have to perform in protecting our colonies and trade routes, and the destructive weapons of offence which science has introduced into the art of naval warfare, and the growth of foreign navies, have all tended to diminish the reliance which has hitherto been placed in the power of a fleet to protect our coast-lines either at home or abroad.

*Our second line* of defence may be counted on your fingers :—

Name.	Displace.	Armour. in.	Guns.	Weight.
1. Glatton . .	4·910 . .	14 . .	2 . .	25 tons M.L.
2. Cyclops . .	3·480 . .	10 . .	4 . .	18 „
3. Gorgon . .	3·480 . .	10 . .	4 . .	18 „
4. Hecate . .	3·480 . .	10 . .	4 . .	18 „
5. Hydra . .	3·480 . .	10 . .	4 . .	18 „

A formidable array indeed! when it is known that the four latter vessels have been reported only fit to go from port to port in favourable weather.

*Our third line* consists of about 100 unarmoured gunboats, ranging from 250 to 450 tons; the smaller class are armed with one 18-ton gun M.L.; the larger class with lighter guns, but more of them. It seems to be evident that in order that this class of vessel should, when accompanied by torpedo-boats, be capable of performing the service for which they are intended, that of warding off the marauding attacks of iron-clad ships or armed cruisers, they should possess far more formidable powers of offence and some amount of armour protection; but I will illustrate my views on these points hereafter.

And as regards *torpedo boats* for coast defences, as yet there are none beyond what is required for the fleet and our coaling stations abroad, and I do not reckon steam launches.

*Our fourth line.* Sir Charles Nugent divides the ports to be protected into three classes. 1. Military ports. 2. Vulnerable points on our coasts of which the wealth and commercial transactions are so great as to invite attack, and of which the fall



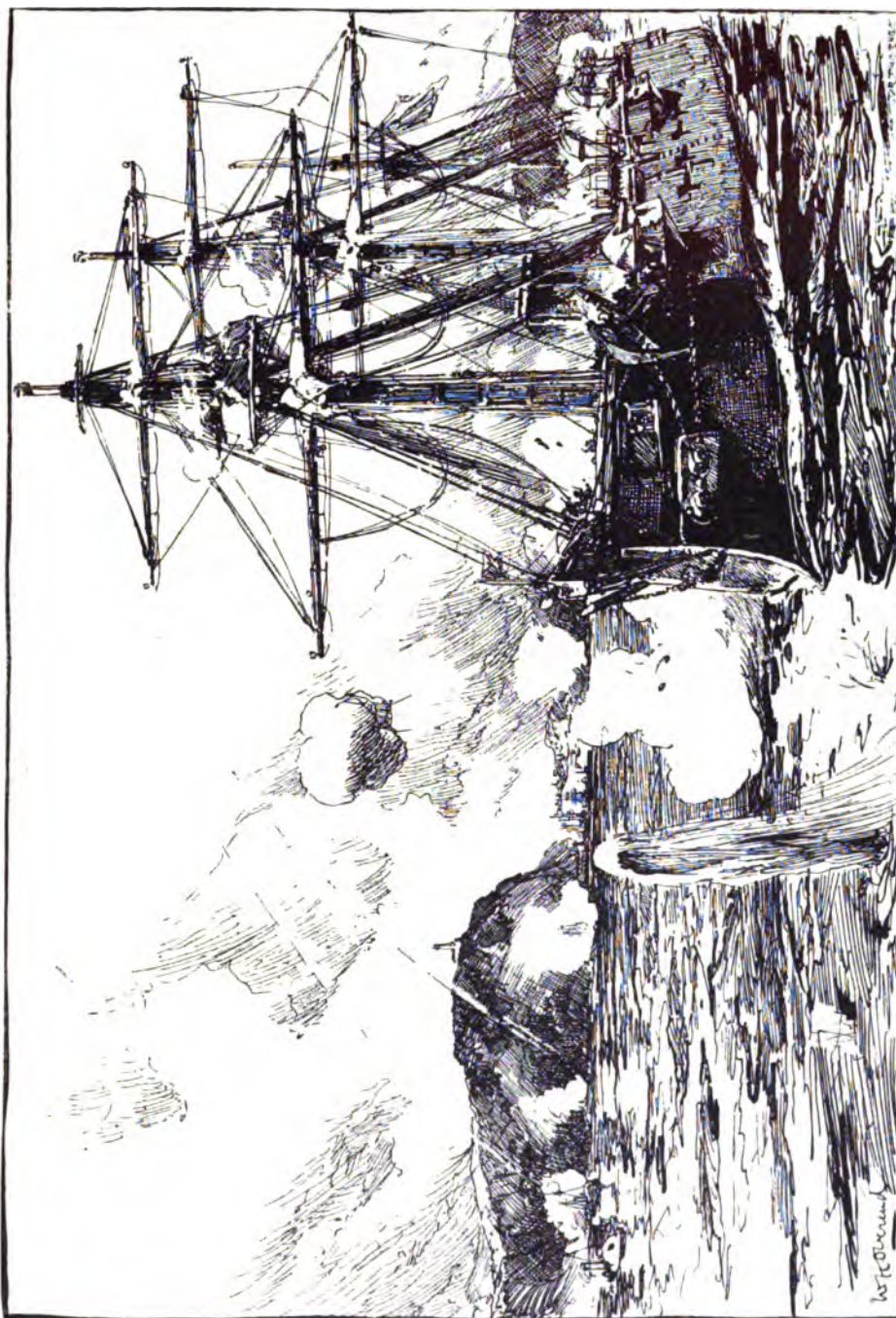


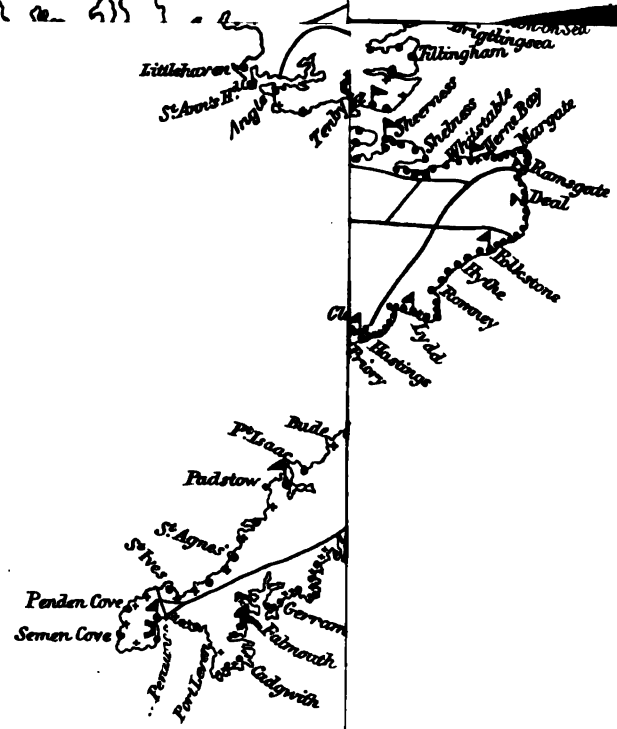
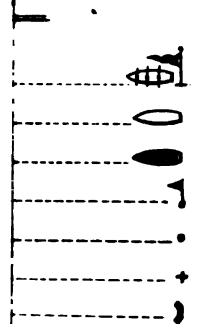
PLATE XII.

IRONCLAD LINE-OF-BATTLE SHIP ATTACKING HARBOUR DEFENDED BY GUNBOATS.

[To face p. 56.]

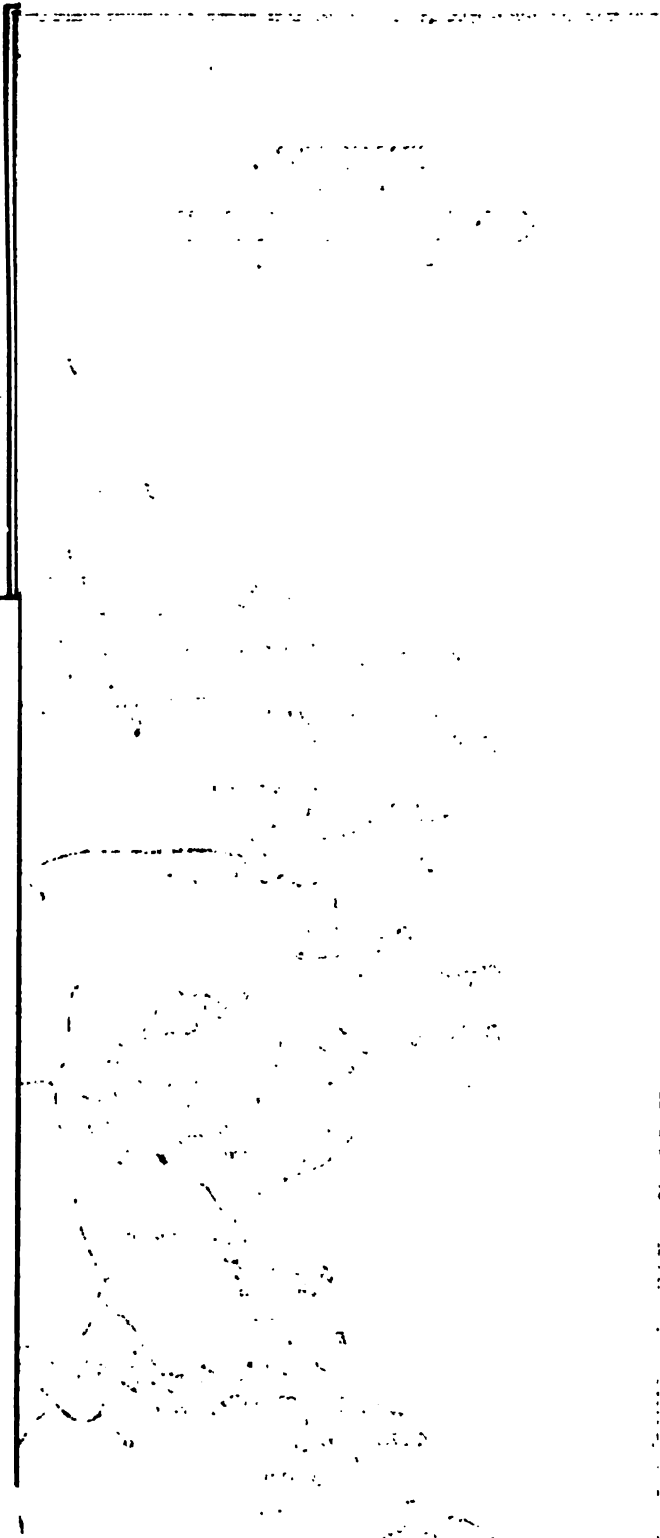
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or bombardment would be attended with serious consequences to the nation; and 3. Ports of secondary importance, some of which would be good bases of operation for any project of invasion. These more or less vulnerable points he divides as follows :—

No. 1.	No. 2.	No. 3.
Military Ports.	Vulnerable Points on our Coasts.	Ports of Secondary Importance.
Portsmouth	London	Harwich
Plymouth	Liverpool	Yarmouth
Portland	The Humber	Lowestoft
Pembroke	The Clyde	The Tay
Cork	Southampton	Aberdeen
Dover	The Forth	Wick
Sheerness	The Tyne Ports	Thurso
Chatham.	The Tees	Ramsgate
	Bristol	Rye
	Swansea	Littlehampton
	Dublin	Poole
	Belfast	Dartmouth
	Sunderland	Wexford
	Folkestone	Waterford
	Newhaven.	Kinsale
		Galway
		And others.

Colonel Nugent thus describes the condition of these three classes of coast localities liable to attack, and the works of defence which should be carried out :—

*No. 1 class* he considers requires development to meet the altered conditions of war material of the present day, especially on the west of Chatham and between it and Gravesend. He says, "The incomplete state of the fortifications of Chatham jeopardizes our great naval establishment there, paralyzes the defences of the Thames by permitting access to their rear, and must, if suffered to continue, act prejudicially upon any measures for the defence of 'London.'" He also urged the impolicy of leaving our only arsenal, "Woolwich," in its present exposed position, and points out the necessity of a subdivision of stores.

As regards *class 2*, he strongly urged the importance of defensive works for the defence of "London," the only capital in Europe unprotected.

Excluding the consideration of "London" and the military

ports, he says of these ports "Southampton" alone is secure, and that from its position, and in a less degree "Bristol" and "Cardiff;" that "Liverpool" and the "Forth" have some defences, good as far as they go, but not far enough; that the "Tyne" is partially defended, and that the defences of the others are *nil*, or so small as to be practically *nil*.

As regards *class* 3, Colonel Nugent says, "For these slight and inexpensive works will suffice;" in fact, a few powerful guns in good position. Again, "There are also stretches, especially upon the southern and eastern coasts, upon which an enemy might land in almost all weathers and at all times of tide, for instance, about Ramsgate, between Folkestone and Beachey Head, and beyond Beachey Head towards Selsea Bill; on the east coast between Colne and Blackwater, in the neighbourhood of Yarmouth and Lowestoft, and some other parts further from London, but which should not be neglected." He does not propose that works of defence should be thrown up at all these places, but that the positions from which to oppose a landing should be carefully examined and marked out. With regard to *submarine mining*, he says this feature of defence "has recently received considerable development, and, combined with shore batteries, is a defence especially suited for our purpose, as, when protected by guard boats on the water, they will compel an enemy to approach cautiously, and to spend more time over the attack than the capture of the place is worth."

I would here observe that expensive engineering works are not so much required to resist naval attacks as numerous guns in favourable positions, and that vertical fire even at long ranges will prove the most destructive to ships; and therefore I attach great importance to the plunging effect of rifle mortars, of which valuable weapon of offence we possess scarcely any—in fact our great weakness lies in our poverty of guns of modern construction of every description.

I need not dwell upon the great importance for peace and war of a harbour of refuge on the east coast. Its great need has long been a standing mark of discredit to the statesmanship of this



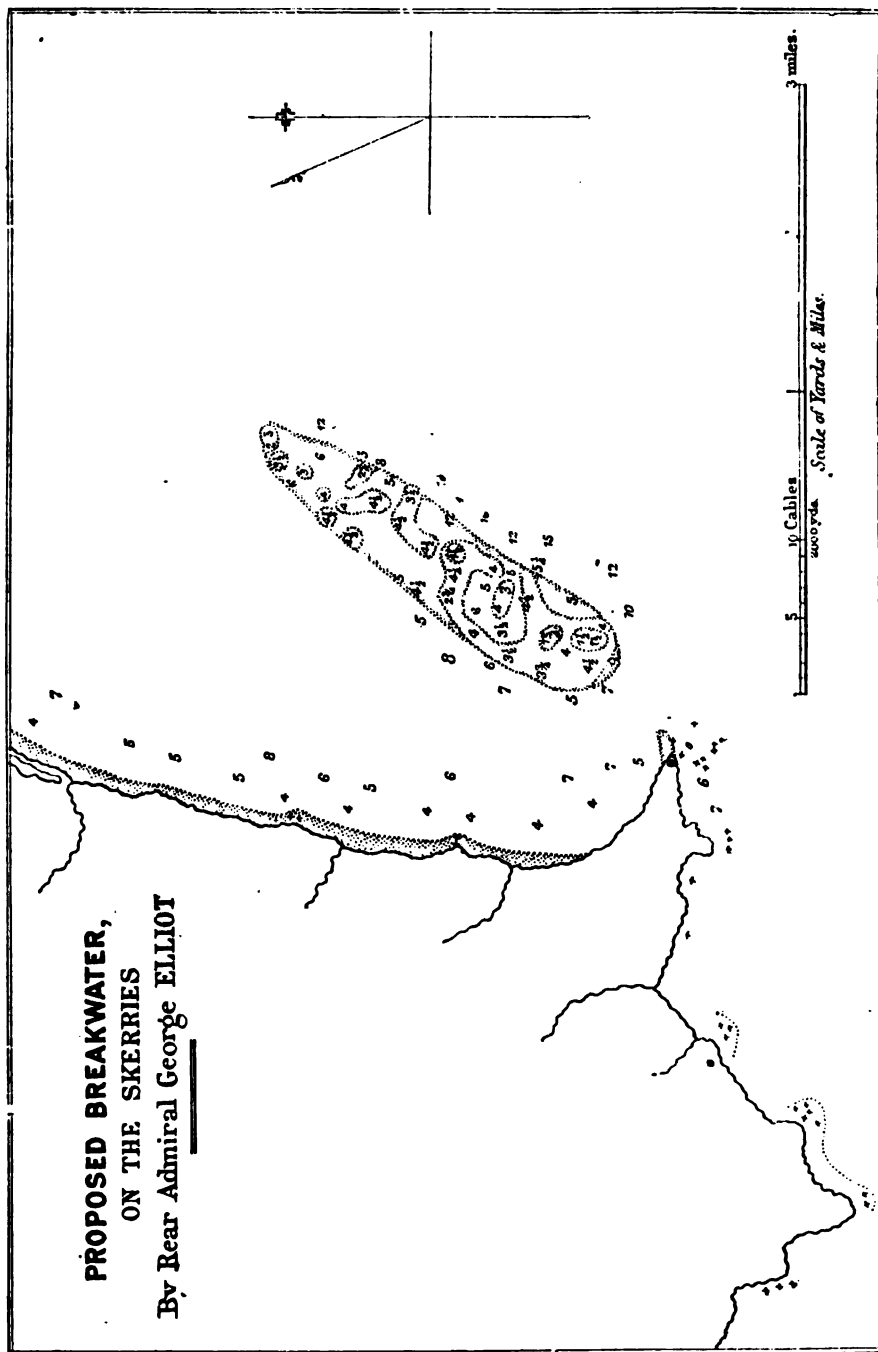


PLATE XIII

[To face p. 50.]



country, and "Filey" has been selected by all authorities as the most advantageous position; but next to "Filey" I have always considered that, although the south coast is better off for shelter places, yet that both for strategic purposes and for commerce a harbour of refuge under the "Start" would present the greatest advantages. A fleet lying under the "Start," with the aid of a few swift cruisers, could efficiently watch a French fleet at "Brest," and a splendid harbour and coal depôt could be formed by erecting a breakwater on the Skerries shoal, as shown by the accompanying map. This project was urged many years ago by an eminent engineer, who estimated the work at one million of money, the same cost as the proposed works at "Filey;" and his plan was to cut through the land and convert the Start point into an impregnable fortress to protect the harbour, and by throwing the *débris* on the Skerries shoal, which shows at low water, to make a breakwater and a coaling-station, with capacious and good anchorage inside. Falmouth and Plymouth Sound will not hold a fleet, and Portland and Portsmouth are too far back from the entrance of the Channel. Such a refuge from storms, and from an enemy's armed cruisers in war time, would be most valuable to our commercial marine, and would constitute the finest strategic position for our fleet for the defence of the Channel.

It has even been suggested that the formation of this splendid harbour would prove a profitable speculation for private enterprise if aided by a Government subvention and by the railways interested. All merchant ships could, on coming from the eastward, or on reaching the entrance of the Channel, replenish coal at the wharves on the breakwater, and thus earn more freight; and there is a lake, separated from the sea by the beach, at "Clapton," which could be converted into repairing docks: and the "Start" point can safely be approached in all weathers—not so Plymouth or Portland; the land side is also admirably suited for graving-docks.

In general terms Sir Charles Nugent contemplates that the defences for harbours of primary importance should be composed



of powerful shore batteries and submarine mines, supplemented by gun and torpedo boats; and, although not mentioned by him, the employment in suitable localities of floating obstructions must not be lost sight of for fouling the screw-propeller, and where the interests at stake are large, and the waters wide and deep, and the channels open, he includes the presence of sea-going armoured vessels of the monitor type. As regards harbours of secondary importance, he considers that smaller batteries combined with mines and flotilla would in most cases suffice. Having thus described as shortly as possible the nature and weakness of the *matériel* required for the protection of our shores, our improvidence is still further displayed in the non-existence of the *personnel* for manning our coast-defence flotilla on the outbreak of war. The Royal Engineers and Royal Artillery, supplemented by these two arms of the volunteer force, would probably suffice for manning the land batteries and for submarine mining operations, but it appears to have been lost sight of, that the entire *personnel* of the navy would be at once absorbed in the fleet. The Coastguard, the Seamen Pensioner Reserve, and the Royal Naval Reserves, and crews of the coastguard ships, would all disappear from the coasts, and then not suffice for the wants of the navy. The only contingent which is at present available to man the flotilla is the much-neglected Royal Naval Artillery Volunteers, numbering about 1400, whereas a force of 25,000 would be required. The neglect of this force is the more reprehensible, because it may confidently be said that at a very little expense no difficulty would be found in enrolling and organizing a Volunteer Coast Brigade in sufficient numbers, and that retired naval officers would readily be found to join such a corps. The force would be purely local, and ready to take the place of the coastguard on the outbreak of war: and for this purpose gun and torpedo boats should be distributed around our coasts in peace time, and depôts for stores should be erected. But in order to go to the root of the evil which has produced such an impaired condition of our coast defences, a reform of administration should be brought about, by which departmental

responsibility could be more distinctly made known. At present it is difficult to draw a line between War Office and Admiralty responsibility for coast defences. The broad line would appear to be, that the Admiralty has to provide and man all vessels which are movable about the coast wherever it may be threatened, and that the War Office is responsible for all stationary local defences. Thus the former department would provide and man monitors and gun and torpedo boats, and the latter, fortifications, mines, and miners.

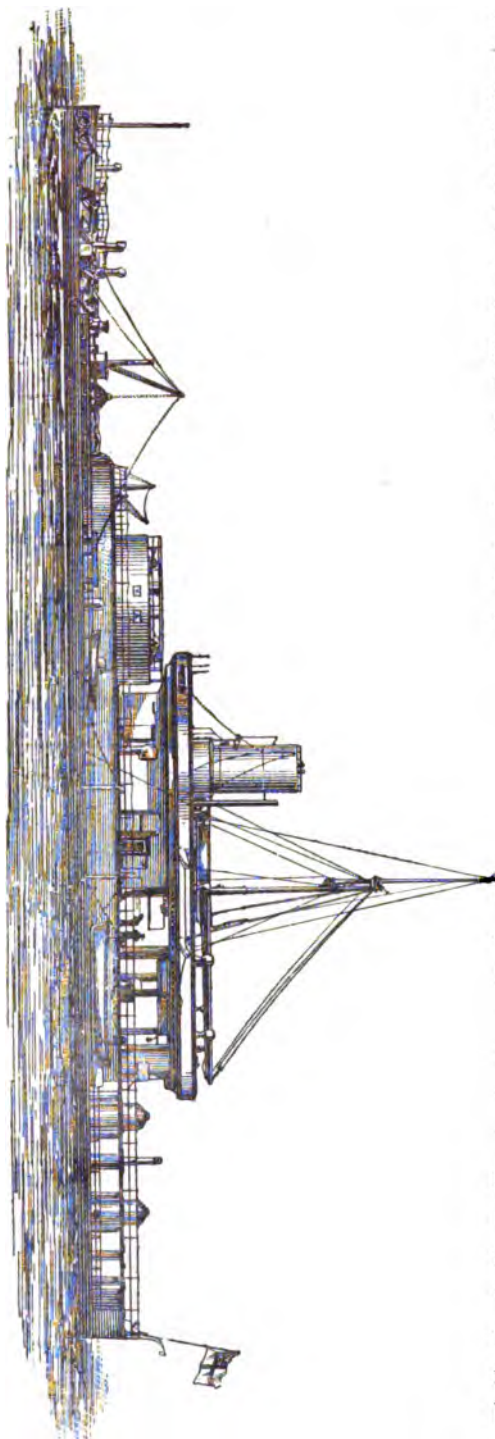
Thus it appears that the Admiralty are responsible for organizing a coast brigade to man the flotilla, and as they have all the means at hand for training an efficient force of volunteers for that purpose, it is to be hoped that no time may be lost in repairing the deficiency ; but a separate vote should be taken to meet the present requirement, apart from the navy estimates, which should not be infringed upon for maintaining the fleet.

It may be observed that the more self-protective our coasts may be rendered, the greater freedom will be afforded to the fleet for strategical operations abroad. Our powers of offence will thus be much increased, and in this respect placed more on an equality with other naval powers, whose coast defences have of late years been greatly strengthened.

In order to arrive at any sound decision as to the best type for modern monitors and gunboats, it is essential to define the exact nature of the services which they are required to perform. The result of a great naval defeat, if our fleet was overpowered by superior forces, would undoubtedly greatly cripple the fleet of the enemy. It is not likely, therefore, that any large hostile force would be available to attack our coasts, but small squadrons of single ships might do infinite mischief, and the action of our neighbours in China has given a forecast of what might be attempted in the way of marauding and bombardment.

It is therefore essential that all gun-vessels, whether monitors or gunboats, intended for coast defence, should possess properties of offence and defence which would enable them to contend against armour-clads or armed cruisers approaching a port for

PLATE XIV. CLASS OF SHIP FOR COAST DEFENCES.  
H.M.S. *Glatton*; type of coast-defence monitor; 4900 tons displacement; 2 guns of 25 tons.



the purpose of bombarding or requisitioning—in fact, for levying black mail or carrying out reprisals. Although locally distributed, the entire flotilla force should possess such sea-going qualities as would render them mobile for rapid concentration within certain limits of coast-line in the vicinity of the ports to which they may be locally attached.

#### COAST-DEFENCE MONITORS.

##### “GLATTON” TYPE.

The *Glatton* is à citadel type of monitor of 4910 tons displacement, mounting two guns of twenty-five tons weight, muzzle-loading, in a revolving turret, and protected by fourteen-inch maximum armour (not compound), and a narrow all-round belt at water-line. For modern requirements this vessel may be called obsolete, but if the type is ap-

proved of, similar vessels might be built for coast defence with more powerful guns and thicker armour, and with corresponding increased displacement.

In the opinion of the writer, it would, however, be more profitable to build a large class of gunboat in lieu of vessels of the *Glatton* type, three of which vessels, say of 2000 tons displacement, could be produced in quicker time and for less money than one *Glatton*, and would bring three, or even six, guns of the same power into action against two of the *Glatton*, and, fighting end-on, protected by a circular armoured shield, would prove a superior defensive force. These first-class gunboats, being more handy, and well supplied with light guns, would be less easily assailed by torpedo-boats than the larger vessels, which is an important consideration.

#### GUNBOATS.

Naval history teaches us how in former wars gunboats carrying long-range guns have driven off ships of the line, and the old liners could bring five times the number of guns to bear upon such an object that armour-clads can now do. A small, movable target is difficult to hit, whereas the larger object can hardly be missed. Having carefully considered the requirements of the present day relating to coast-defence vessels, I can see very forcible reasons for having two classes of gunboats, the smaller class for shoal waters, but with long-range guns, and a larger class for closer attack, to take the place of coast-defence vessels of the *Glatton* type. The efficiency of the modern gunboat will be correlative with the power of the gun which is brought into action, and the amount of protection which is afforded. These properties can only be obtained on the principle of *end-on* bow attack and defence, which position must always be preserved, whether advancing or retiring, within range of gunfire. It is also important that these vessels should be able to pass over floating obstructions, or touch the ground in shoal waters, without risk of damaging the propeller. The advantages of hydraulic propulsion are most conspicuous for these purposes,

and as great speed is not essential, there can be no reasonable grounds for not applying it. The following description of these two classes of gunboat would, in the writer's opinion, fulfil the conditions of efficiency above referred to. Any reduction of the armament or defensive properties of these vessels would deteriorate from their value.

## APPROXIMATE DIMENSIONS.

	Smaller Class.	Larger Class.
Length . . . . .	160 feet . . . . .	200 feet.
Breadth. . . . .	32 „ . . . . .	36 „
Draught . . . . .	12 „ . . . . .	14 „
Freeboard . . . . .	6 „ . . . . .	7 „
Ditto to bulwark . . . . .	10 „ . . . . .	11 „
Displacement . . . . .	1000 tons . . . . .	1600 tons.
Effective H.P. . . . .	1000 . . . . .	1600 H.P.
Speed at the measured mile . . . . .	11 knots . . . . .	12 knots.
Armoured breastwork . . . . .	8 in. maximum tapered . . . . .	14 in. maximum tapered.
Water-line belt and part of side and deck over boilers {	3 inches . . . . .	4 inches.
	1 inch . . . . .	2 „
Armament . . . . .	1 64-ton B.L. . . . .	1 110-ton B.L.
	2 4½-ton B.L. . . . .	4 4½-ton B.L.
	6 machine guns . . . . .	6 machine guns.
Propeller . . . . .	Hydraulic . . . . .	Hydraulic.

The accompanying profile-drawing and plan-drawing represent the smaller class, but they are typical of the larger class. The armour protection afforded to the smaller gunboat is calculated to resist penetration, that is to say, to deflect projectiles at one-mile range from all light rifle guns, such as are carried on the broadside of existing ships. The larger vessel is calculated to deflect projectiles from all armour-piercing guns at 1000 yards range. The tactics of these gunboats would be, frequently to alter their range in the smoke, and never to expose their side to an enemy. If the Hope gun fulfils expectations, it will prove most advantageous for flotilla warfare, as no possible armour a ship could carry would resist the Hope 100-ton gun, with an initial velocity of 3850 feet per second, a total energy of blow of 123,393 foot tons, and a penetrating energy per inch of circumference of shell of 3272 foot tons, which represents nearly three

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times the power of the service 110-ton gun now being constructed. Such a gun would enable gunboats to fight successfully at longer ranges. With reference to the gunboats which appear on our navy list, which carry light guns, and are totally unprotected, it need hardly be said that in these days of destructive gunfire they would be mere slaughter-houses if they were sent into battle; but as we have about 100 of them, they may be converted into use for drill purposes for the Coast Brigade, or as depôt ships, or for protecting fisheries and other services in peace time.

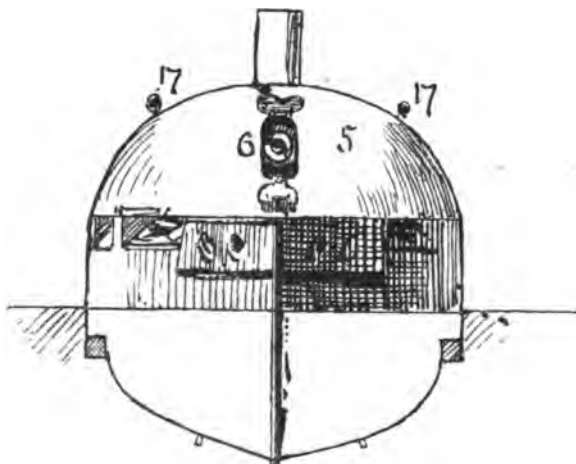


PLATE XVI.—BOW VIEW OF PROTECTED GUNBOAT.

#### TORPEDO BOATS.

Coast defence by torpedo boats *alone* would not be effective. These vessels during night-time would prove most deadly against ships lying off a port, but an enemy would probably retire before dark rather than risk such a danger. By daylight their approach would be perceived, and single ships under weigh would manoeuvre to keep them under fire of light artillery and machine guns long enough to destroy them; but if accompanied by gunboats they would have a far greater chance of success by watching their opportunities, which would be favoured by smoke. This combination is therefore most essential.



**APPENDIX**

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## CHAPTER VI.

## ENGLAND'S EXPOSED POSITION.

## PART II.—OUR DEFENCES ABROAD.

A GREAT deal of valuable information has lately been presented to the public through the press relating to our defenceless position, it is therefore not my intention to weary my readers by recapitulating the evidence which has been produced to prove the inadequacy of our land and sea defences.

The nation at large has become so completely aroused to a sense of its great peril, that it is not possible for any Government to altogether resist the force of public opinion; but judging from the speeches of ministerialists, who, it must be remembered, are standing on their defence for negligence in the past, it is to be apprehended that efforts will still be made to minimize the danger which threatens us, and to place delays and restrictions on the fulfilment of essential requirements. Already the following grounds of objection have been raised against prompt action and any large expenditure of money on national defences :—

(1) That armaments soon become obsolete owing to the rapid progress of scientific discovery. (2) That large sums of money have been wasted on faulty design and structural defects of ships of war. (3) That professional opinions differ greatly as to the character of the armaments and types of vessels of various classes most suitable for imperial defence.

As these arguments are likely to carry weight in the minds of the uninitiated, and as they can easily be disposed of as insufficient excuses to justify inaction, it is highly important at the

present time that they should be replied to and not allowed to influence the decisions of Parliament.

My object will therefore be to refute these arguments, and to compare critically the various opinions which have been made known through the press relating to the protection of our colonies and ocean highways in war time, and to remark upon the characteristic features of the naval armaments to be provided for that purpose.

In the *first* place, then, with regard to the argument for delay and for restricted expenditure, advanced by official optimists on the grounds of the rapid progress of scientific discoveries, that excuse, if admitted at all, will hold good for all times, and applies with less cogency to this country than to any other, inasmuch as we can better afford to pay for renewing our armaments as they become obsolete. But a stronger motive still lies in our far greater dependence than all other nations on our naval supremacy for national security.

*Secondly*, as regards faulty designs and structural defects of ships of war, no doubt great blunders have been committed in the past, and that this is a blot on our administrative capacity; but the remedy is within easy reach, and has been constantly impressed upon our rulers by naval reformers, both in and out of Parliament, without commanding the attention it deserved. The demand for a more enlightened supervision over the ship-building department of the navy, and the ordnance department of the War Office, has been loud and continuous, but the reliance on the exclusive action of a few overworked departmental officials has been persevered in, and all appeals for select committees of inquiry have been persistently refused, on the grounds of undesirable interference with the responsibility of the Board of Admiralty.

The question may well be asked whether responsibility has ever been attached to any Board, or to any individual member of a Board of Admiralty, or to any of the permanent officials, for any one of the many blunders which are to be detected in the fleet we possess; such as armour-clads with unprotected ends

and weak ram bows, and others that won't steer and roll fearfully, and steamers compelled to carry a burden of ballast to insure safety? In fact, for a want of practical conception of the essential requirements of war, displayed in the heterogeneous and defective character of the fleet; and that most serious defect of all others, the deliberate abandonment of the only means of escape from capture for all the weaker classes of war vessels owing to want of speed.

It cannot be supposed for a moment that had these designs been from time to time submitted to the mature consideration of scientific committees composed of the best intellect of the country such blunders would have been perpetrated.

The description given by the late First Lord of the Admiralty, Mr. W. H. Smith, M.P., of "The Navy: its Duties and Capacities," in the November number of the *National Review*, 1884, affords the most ample testimony that this system of exclusive action has been productive of great evil to the efficiency of our imperial defences, and has caused an extravagant waste of public money. He shows that our whole fleet of corvettes and sloops and gun-vessels of various classes, numbering about 200 on the navy list, are so deficient in speed, gun-power, and protective appliances, that they are useless for war purposes, and have no chance of escaping capture, and that the ten or twelve armed cruisers we possess, built and building for the protection of commerce, could not, owing to insufficient speed, come near such vessels as would prey upon our mercantile marine. In fact, that a few of such armed cruisers as the *Esmeralda* could commit their depredations with impunity; and it must be remembered that there is no question of obsolete armour involved in these unarmoured vessels. They have been knowingly deprived of the first element of safety and efficiency, *speed*, and this in defiance of the loud and continued protests of the naval service at large.

The *third* argument adduced in opposition to any large and immediate increase of the navy is based upon the apparent diversity of opinion amongst professional officers on those

tactical points of efficiency which govern the design and construction of ships of war, and as regards the preference to be given to the different arms of the service in the matter of expenditure of the national funds. Some writers give the greatest prominence to armour-clads, others to armed cruisers, and others to torpedo vessels, but I shall have more to say on these points hereafter. What I feel convinced of is, that the disagreement which appears to exist amongst naval experts, at least with regard to the broad principle of naval efficiency, is entirely owing to the want of occasional collective inquiry into the questions involved. It is greatly to be regretted that naval officers have not more frequently been brought together for matured consideration and report on essential points on which they have appeared to differ. Having sat in times past on four different committees on technical naval subjects, and as a member of the Royal Commission on National Defences in 1860, I can speak from experience of the great advantage of collective investigation as a means of reconciling different lines of thought. It is always found that a valuable amount of unanimous agreement is certain to result from exhaustive inquiry, and that on any points of divergence of opinion which may arise a separate report brings to light in detail the grounds of disagreement as a guide to the ruling departmental authorities.

At the present crisis the appointment of a Royal Commission will afford the only security that a wise departure will be taken for the restoration of our naval supremacy; but will the Admiralty submit to be thus advised? The demand will be made, but I fear that, as heretofore, we shall find that our so-called economists will follow the parliamentary secretary of the Admiralty into the lobby against such a slight being imposed upon the departmental capacity and foresight of the Board of Admiralty. And thus blunders will be perpetuated, for Admiralty lords, even if heaven-born geniuses, are too much engrossed with the many questions of daily routine to devote sufficient time and attention to the intricate subject of the design and construction of ships of war. Therefore much is

left to the decision of a few permanent officials, whose brains are overworked, and who, having fallen into the *inevitable groove*, frequently arrive at immature conclusions for the want of more intelligent investigation.

I will now proceed to offer some opinions on the characteristic features of the armaments on which we must depend for the protection of our colonies and commercial interests on the wide ocean.

#### COLONIAL COAST AND HARBOUR DEFENCES.

I refer my readers to Chapter V., on the subject of "Home Defences," which equally applies to our possessions abroad, and to which I have nothing to add except to emphasize the opinions I expressed of the essential requirements—for harbour defence—of a combination of gunboats with torpedo boats to contend against such attacks as are likely to be made by single ships or small squadrons on our colonial ports and coaling-stations during the absence of the fleet. If it was decided to construct immediately 200 first-class torpedo boats, it would be none too many for our imperial necessities, but if unaccompanied by powerfully armed gunboats, they would fail to provide an effective coast and harbour defence, for reasons which I described and illustrated in Chapter V. It is highly important that the gunboat feature of our armaments should be fully considered by tacticians at the present time, because, owing to the economic craze for torpedo boats as a universal implement of warfare, the intrinsic value of combined gunfire covering the attack is likely to be overlooked, whilst other nations have turned their attention to this powerful arm of defence. It must be apparent to all that, owing to our vast extent of coast-line, the introduction of the torpedo offers us the greatest advantages for coast defence; but, on the other hand, for ocean warfare this weapon of offence has even more largely than steam motive power contributed to lessen our superiority as a maritime nation, by levelling seamanlike qualities to a condition of comparative equality. This event will have a still more



injurious effect, if the temptation of economic outlay on defensive armaments should induce our rulers to form a hasty and exaggerated opinion of the universal efficiency of torpedo boats *alone* for coast defence as well as for ocean warfare, to the neglect of other armaments. In fleet battles at sea they would prove most deadly against existing armour-clads, where ships are crowded together; but to my mind there is nothing impossible in the endeavour which must be made to resort to such counteracting measures as will provide against the destructive effect of torpedoes in fleet actions. In the case of single ships or small squadrons having plenty of sea-room for manœuvring and possessing a full amount of speed, and when the approach of torpedo boats can be perceived, they ought to be destroyed by gunfire; this would also be the case in the defence of sea-ports, if they were unsupported by gunboats which would draw off the attention of the enemy when the smoke would disguise their movements.

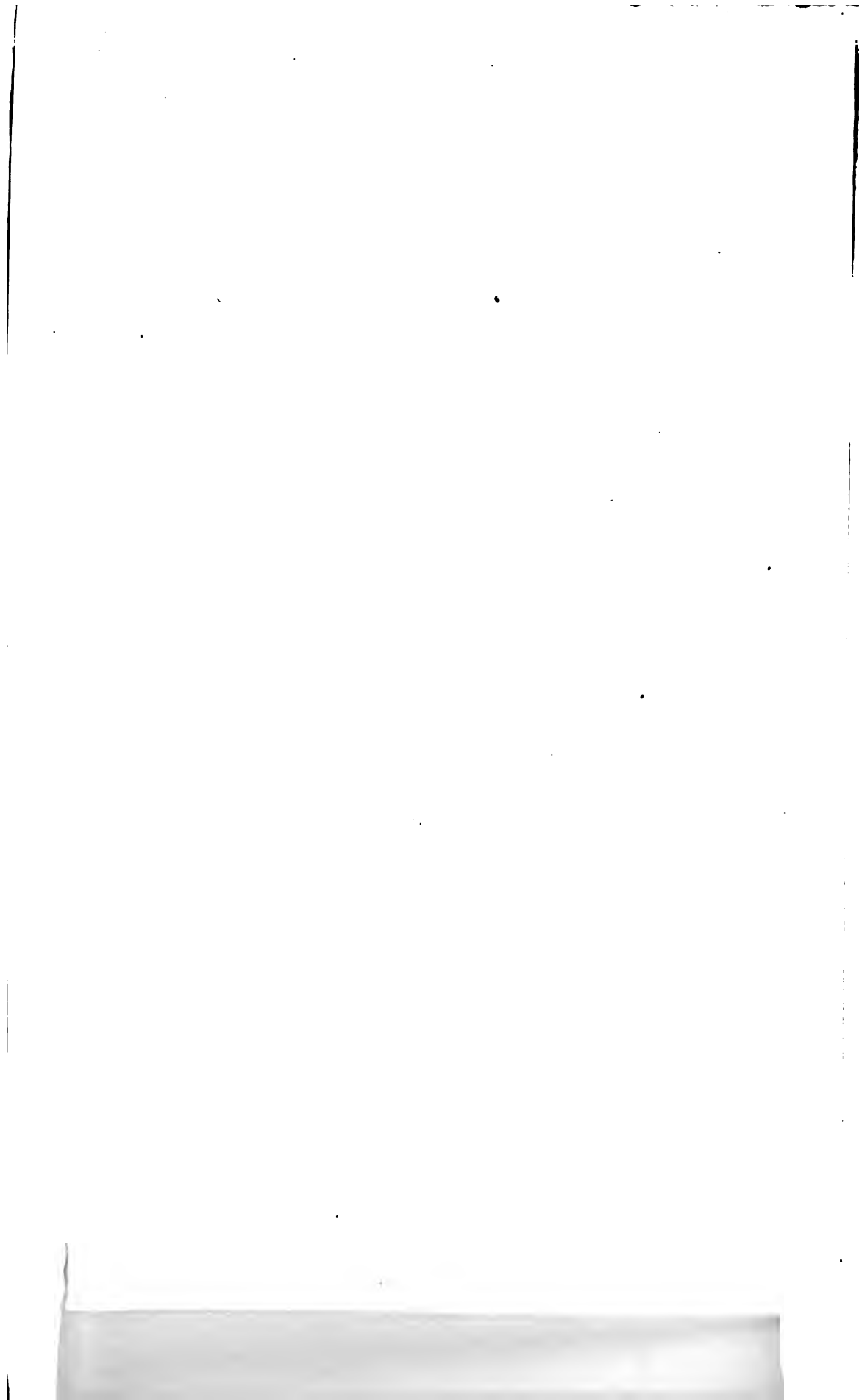
I have dwelt upon this feature of future naval warfare because of its supreme importance, and because I am convinced that some protective measures can be applied and ought to be at once adopted, when we are about to strengthen our naval forces to provide against the deadly effect of submarine attack in fleet actions. It would appear that there are two practical modes by which this object can be effected. The method I have proposed is that of a fixed crinoline protection attached to the under-water hull of *that class of armour-clads intended to form the line of battle*, where a sacrifice of speed is not a material loss of fighting efficiency; this novel feature of protection was fully described in Chapter I. The other method proposed is by means of covering the approach of our fleet by numerous swift little vessels armed with machine guns to destroy the torpedo boats of the enemy. I hold strongly to the first method, because it would disarm all torpedoes, whether projected by ships or by boats; whilst the latter would have only a partial effect, and still less so, if the torpedo flotilla is not sent out in advance, but accompanies the fleet into action. But this is one

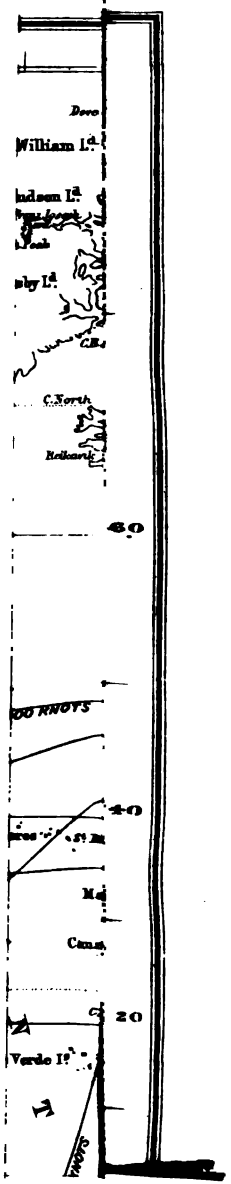
of those subjects which should at once be submitted to exhaustive inquiry by a select committee, as it is imperative that, whichever plan is adopted, it should be efficiently and immediately carried out. The other class of armour-clads intended for foreign service should have a high rate of speed, and find their safety from torpedo attack by manœuvring. At any rate, the scare about torpedo boats should not for one moment arrest the progress to be made in increasing the armour-clad fleet; for I am entirely in agreement with what is evidently the prevailing opinion of professional officers—that the command of the sea will belong to the most powerful fleet of armour-clads. This opinion does not in any way lessen the demand for all other essential arms of the service—armed cruisers, gunboats, and torpedo boats—for to ride either hobby against the other would be fatal to efficient imperial defence. If we are not overpowering with each of these arms of the service, the one weak point will compromise the whole. It may be at the present crisis that we are weakest in torpedo boats and armed cruisers, but if the armour-clad fleet is overpowered, a victorious enemy will attack or blockade our entry ports, and then of what avail will be our protected trade routes?

If only our coast and harbour defences are rendered efficient, and the approaches to our shores are adequately guarded, and that our entry ports are thus open for trade, there need be no fear but that our wants would be supplied by neutral vessels, and that competition would keep down prices.

#### OUR SQUADRONS ON FOREIGN STATIONS.

It may be taken for granted that these squadrons, which will form the first line of defence of our colonial possessions, will have to be immediately strengthened on the outbreak of war sufficiently to command the seas on their respective stations. The necessity for an Intelligence Department at the Admiralty, permanently maintained in peace time, for collecting information of all kinds relating to the naval resources and commerce of the





world, trade routes, lines of communication ready to be brought into extended use in the very first stage of war, will provide the only means by which intelligent strategical movements of the fleet can be directed. The first duty which these squadrons will have to perform, will be to watch the proceedings of the similar class of ships of the enemy, to seek an encounter, and thus safeguard our colonies. In order that they should have freedom of action, it is essential that our coaling-stations and principal colonial ports should be rendered capable of resisting an attack, at any rate, by any small force of the enemy. The accompanying Map shows the Trade Routes and our coaling-stations all over the world and their distances apart. The coaling-station in the China Sea marked in red ink on the map is our latest acquisition, called Port Hamilton. It is situated on the North China station, and would be most valuable in the event of war with Russia as a base of operations, as it lies only 500 miles from "Vladivostock," whereas Hong-Kong, which was our nearest coaling-station, is nearly 2000 miles off. Port Hamilton is formed by two small islands in the Corea Straits between Japan and Corea, in latitude  $34^{\circ} 30' N$ . It is a commodious and safe anchorage, and, *if fortified*, could be held by a small force. The climate is healthy. This harbour is clear of danger on all sides, and could be safely entered at night, if the weather is not very thick. The most watchful care must be taken by our Intelligence Department to ascertain the movements of the home fleets of the enemy, in order to prevent our squadrons abroad being overpowered in detail and our colonies assailed. Whichever foreign power possesses the command of the Suez Canal route to the East will be able to concentrate forces in that direction much more rapidly than England could do, even if such intentions were ascertained. The importance, therefore, of the British command of the Mediterranean becomes intensified for strategic purposes of war, and points to the imperative necessity of greatly strengthening our armour-clad fleet. No correct decision can be arrived at as to what that strength ought to be, until the fact is accepted

that, as the naval ports of France are situated between England and Malta, the entire French fleet would have the power of concentrating in either direction; and therefore, that it would be reckless folly for England to attempt to command the Mediterranean and the Channel unless each division of her fleet was powerful enough to engage the whole fleet of France at both these distant points in a war with France alone: this power to be in addition to strengthening her foreign squadrons. For further particulars *vide* Chapter IV.

#### ARMED CRUISERS FOR THE PROTECTION OF COMMERCE.

This feature of national defence has naturally created a lively interest, especially in commercial circles, and cannot be too largely commented upon at the present time, with a view to an enlightened grasp of a subject which so deeply concerns the life of the nation. The question of placing reliance on the facilities for converting our fastest merchant steamers into armed cruisers has been freely discussed, and professional opinion has decidedly condemned this policy on the grounds: (1) that they could not be converted quickly enough to be serviceable at the most critical time of need, namely, the first stage of war; and (2) that they would not, when converted, be efficient to meet the armed cruisers they would have to contend against; and (3) that these fast vessels would afford the best means of keeping up our supply of food and raw material. But their owners would act wisely to arm these splendid ships with chase guns, and protect their boilers by a covering deck for their own safety, and thus enable them to carry on their trade without interference under the British flag, as their great speed will completely secure them from capture.

The opinions lately published in the press vary considerably as to the best type of armed cruisers which should be introduced for the protection of commerce, but all parties agree that the first element of efficiency for this class of war ship will be the highest rate of speed obtainable. Opinions differ, however, as

to the amount of effective fighting power which should be afforded, and this question must regulate size and expenditure. Sir William Armstrong recommends *Esmeraldas*, and Sir Edward Reed advocates armour-plated cruisers of the *Imperieuse* and *Warspite* type, now building, but with the condition that they should possess twenty knots' speed instead of sixteen knots, for which they are at present designed; this of course would entail increased proportions and cost. The following are the particulars of *Imperieuse* armour-plating: on belt 10-inch steel faced, on barbettes 8-inch, on covering tower 9-inch; deck-plating: 2-inch forward, and aft 3-inch.

*Guns*: four 18-ton B.L. in barbette; six 6-inch B.L. on sides, and speed sixteen knots.

These vessels with speed increased to twenty knots would indeed be most powerful cruisers; but as their displacement would not be less than 8000 tons, they would belong to the type of second-class armour-clads rather than to that of protected cruisers. Looking to the fact that armed cruisers having equal speed will be enabled to avoid combat with more powerful armour-clads, and to the enormous ocean lines of route to be protected, and to the class of vessel likely to prey upon our commerce, and that two 20-knot cruisers of 5000 tons displacement with cellular deck protection could be built for the same money as one 20-knot *Imperieuse*, and with a 3-inch steel cellular deck covering the vitals fore and aft, I consider that the greater number of the smaller vessels would be a more profitable expenditure of money for the protection of commerce, although it is most essential that a certain number of 20-knot *Imperieuses* should be built as second-class ironclads to contend against similar class vessels in foreign navies, but to carry heavier armament. The protected cruisers England now possesses, built or building, having a speed of from fifteen to seventeen knots, are only sixteen in number, not counting the two despatch vessels, *Iris* and *Mercury*. There are a considerable number of other vessels of lesser speed, but on that account of little value for the protection of commerce, and for the same reason dangerously

exposed to capture on the outbreak of war. But the defective condition of the fleet we possess as regards speed is unfortunately

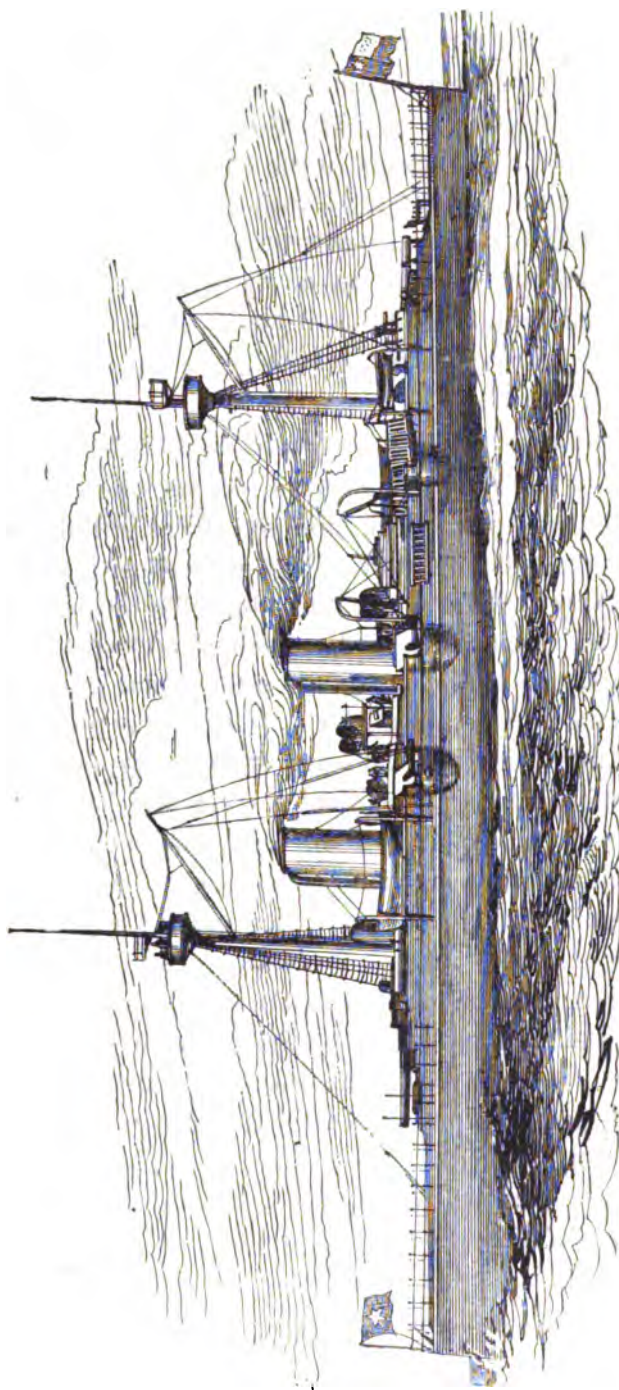


PLATE XVII.—THE CHILIAN CRUISER "ESMERALDA."



as conspicuous as its numerical weakness, and it is not too much to say, that with five times the number of armed cruisers and gun and torpedo boats, and twice the number of armour-clads, England could only claim to fulfil all her imperial duties, that is to say, to command the Channel and Mediterranean and colonial waters and commercial highways against France *alone*. The accompanying design and description of the Chilian cruiser *Esmeralda* display considerable merit for a vessel of only 3000 tons displacement, but as cruiser for the British navy a somewhat faster and more efficiently protected vessel is required, necessitating a displacement of 5000 tons, and this class of cruiser should replace all corvettes and sloops and gun-vessels now employed on foreign service for protection of commerce—in fact, the golden rule should be that the weakest vessels should have the greatest speed. This type of vessel with two knots' additional speed, and a stouter protective deck, and a raft or cellular body at water-line, which would entail a higher freeboard and greater draught of water would make an admirable cruiser for the British navy, and require a displacement of 5000 tons.

Referring to the controversy on the subject of convoying which has appeared in the columns of the *Pall Mall Gazette* between Mr. D. R. McFarlane, Mr. Thomas Sutherland, and Captain J. R. C. Colomb, I would merely remark that whilst not altogether discarding the idea of occasional resort to safe convoy, I would endorse Captain Colomb's opinions, "that England can no longer look to that mode of protecting commerce in war time, and that we must rely for the security of our commerce in war time to our possessing the power of clearing the seas of our enemy's war fleets and of privateers, and that ocean strategy, truly applied, can afford greater security to our commerce now than in the days of sailing ships, provided that we—

"(1) Spend on our navy in the same proportion to our sea trade, now, as our fathers did for long years after Trafalgar.

"(2) Adequately protect our coaling-stations and great mercantile ports.

“(3) Tear up the ‘Treaty of Paris’ the moment war is declared, and as a united empire do our duty.”

The most practical view to be taken of the fate of our mercantile marine in the event of a sudden outbreak of war is, that if our Intelligence Department is active and well prepared, and if timely notice is thus afforded, all sailing ships would remain in port, and slow steamers would wait until transferred to neutral flags or convoyed. Our fastest merchant ships would, tempted by higher freights, run the gauntlet of an enemy's cruisers, which their great speed would enable them to do with safety, as even if caught within gun-shot at night, it is not likely that cruisers would constantly maintain a high pressure of steam, which would afford the means to the trader making his voyage by which he could increase his distance.

If England will only enforce upon her rulers that reasonable precautions for safe-guarding our empire must be maintained at any cost, and that the policy of risking the life of the nation with the object of reducing the national debt is a *policy of fools*, we shall have no cause to fear starvation or ruin or loss of empire. But as the present Parliament shows a total want of capacity to recognize our danger, the fate of this vital question of naval supremacy must rest with the constituencies, in the pledges exacted from their representatives at the next general election. In closing these remarks, there is one strategical feature connected with our defences abroad to which I desire to call special attention, and that is the establishment of floating coal depôts in mid-ocean at selected points of navigation.

Such vessels as the *Great Eastern*, with twenty knots' speed, would supply the most serious want which would be felt in future naval warfare, and perhaps a subsidy would induce some of our large companies to build a few vessels of this description; their speed would insure their safety from capture.

It is to be hoped that the experience of the past may have convinced the nation of the great danger which has arisen from giving credence to those false prophets who have been propagating the evangel of peace and retrenchment, as if the millennium had arrived.

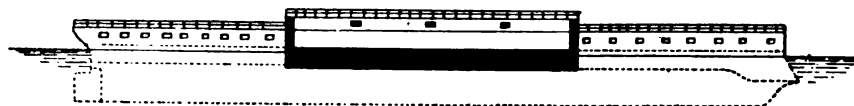
## CHAPTER VII.

### SOME PRACTICAL REMARKS ON DESIGNS FOR SHIPS OF WAR.

I SHALL not, on the present occasion, make special reference to the numerical weakness of our fleet, but confine my remarks to what relates to its production, and to those features of design and construction which affect its efficiency; and as it is evident that the present Government have no intention of adequately increasing our naval strength, it becomes the more important that such ships as are to be built shall possess those qualities which will render them most efficient in the day of battle. The least that can be said about the fleet we possess is that its obsolete condition and other serious defects display a lack of skill and foresight which is discreditable to the nation; but it is to be hoped that a new departure may be taken and a more careful supervision exercised in the future over our naval expenditure.

In comparing the strength of the navies of Europe, Admiralty officials have adopted the theory that the gross displacement of a fleet represents an accurate measure of its fighting power. But this is dangerously misleading, because by this rule of comparison the gross weight of guns in our armoury might be reckoned as a fair estimate of their efficiency in battle, and thus smooth-bore guns might be pitted against breech-loading rifle ordnance, in the same manner as this theory of comparative gross displacement of a fleet proposes to pit obsolete ships and ships with inferior fighting qualities against an enemy's ships more skilfully designed. Such attempts to bolster up the imperfections of our navy indicate gross ignorance and a low appreciation of the intelligence of our enemies.

COLLINGWOOD.



AMIRAL DUPERRE.

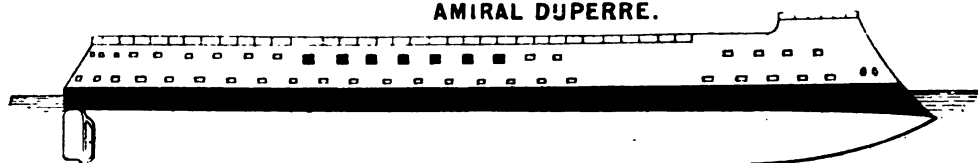


PLATE XVIII.

## SHIPS WITH 15 INCH ARMOUR AND UPWARDS.

CENTRAL ARMOUR SHIPS.		BELTED ARMOUR SHIPS.	
ENGLISH.		FRENCH	
INFLEXIBLE			AMIRAL BAUDIN
AJAX			AMIRAL DUPERRE
ACAMENON			DÉVASTATION
COLOSSUS			FORMIDABLE
EDINBURGH			FOUDROYANT
COLLINGWOOD			HOCHE
RODNEY			MAGENTA
HOWE			MARCEAU
CAMPBELL			NEPTUNE
BENBOW			CAIMAN
ANSON			INCOMPTABLE
			REQUIN
			TERRIBLE
			FURIEUX

PLATE XIX.

It is evident that the true superiority of a fleet cannot be estimated by its gross tonnage, but by the perfection of those features which constitute efficiency in each class of ship for the special duties required to be performed. It is well known that

in these days of scientific warfare, the skilful employment of weight is of the essence of efficiency, and hence has arisen the outcry against unprotected ends and inferiority of speed and gun-power in the ships we possess.—See Plates XVIII., XIX.

I say unprotected ends, because not only are they unarmoured, but the substitute plan of a raft body has not been carried out, nor its accompanying feature, of armour-plated bow and stern, to deflect raking fire. Therefore all these lately-built armour-clads are deplorably inefficient. That armour-clads have become obsolete in a few years, is attributable to not having recognized the certainty that this system would only introduce guns of greater power. Unfortunately the experience of the past has not yet convinced our authorities of the imprudence of risking the life of our ships to a chance shot from an enemy in battle, when the same weight of iron employed in the Cellular Deck principle of protection would greatly reduce the danger and prove equally effective against guns of any calibre. I desire particularly to call attention to one most important consideration which materially affects the comparative value of the two systems of water-line protection, namely, Belt Armour and Cellular Deck construction, which is, that whereas the weight of armour which is available for defence must be absorbed by the belt in order to offer any reliable protection, the Cellular Deck system, by economizing weight at the water-line, enables a larger amount of armoured protection to be afforded to other parts of a ship where it is most valuable for fighting efficiency, such as:—

1. Armour-plating round the bow and stern as a protection against raking fire.

2. Stouter armour on barbettes and conning towers for gun protection.

3. Safety screens and traverses and stouter skin of ship on battery deck, for protection of the crews.

This unfortunate craze for outside armour of whatever thickness is going to be perpetuated in our latest designs for armed cruisers, whose water-line belt protection is to be only ten

inches thick! And this constitutes the sole defence which will stand between the magazines and boilers and the guns of the enemy, in fact between life and death of a ship.—See Table A.

The accompanying table shows the penetrating power of the guns now in use, and which will have to be met with on the high seas. The B.L. 18-ton gun has penetrated thirteen inches

TABLE A.  
BALLISTICS OF RIFLED B.L. AND M.L. GUNS.

Gun.	Weight.	Charge.		Projectile.	Bursting Charge Common Shell.	Muzzle Velocity.	Muzzle Energy.	Penetration Wrought Iron, 1000 Yards.	Remarks.	Estimated Penetration Compound Armour, at 1000 Yards.
		Battering.	Full.							
17" B.L.	Tons. 100	lbs. 771½	—	lbs. 2005	lbs. 78	Feet per Second. 1831	Feet Tons. 46,809	Inches. 31'	Trials at Spezzia, November, 1882. See Proc. O.C. 2, 863. See Report of O.C., No. 239.	Inches. 21
15" "	63	880	—	1700	50(?)	2100	52,000	32'5		25
13"5 "	63	625	—	1250	40(?)	2050	36,415	28'6		23
12" "	43	283	216	714	30(?)	1900	17,904	10'3		18
10" "	26	300	—	500	20(?)	2100	15,385	21'1	Approximate M.V. with charge, 1700 feet per sec. Land-service gun. See Report of O.C., No. 198.	15
9"2 "	18	200	—	320	15(?)	2100	8938	17'		13
8" "	12	100	—	180	13	1975	4840	12'3	No. 6" gun now has a 42-lbs. charge, but it is intended that the Mark III. gun shall use it.	10
6" "	Cwt. 80	42	—	100	6½	1900	2503	10'1		8
6" "	81	34	17	100	6½	1890	1980	8'9		7
5" "	34	17	—	50	3(?)	1750	1040	—	The original charge was 14-lbs., which gave a muzzle velocity of 1930.	—
4" "	23	12	—	25	1½	1738	523	—		—
16" M.L.	Tons. 90	lbs. 450	lbs. 337½	lbs. 1700	lbs. 60	Feet per Second. 1804	Feet Tons. 30,329	Inches. 23'3	Chambered gun.	Inches. 18
12"5 "	38	210	157½	820	33	1575	13,554	17'1		13
15'5 "	38	160	100	820	33	1442	11,842	16'1	Unchambered gun.	13
12" "	25	85	55	615	38	1288	7195	13'3		11
11" "	25	85	60	546	30	1314	6559	13'4		11
10" "	18	70	44	410	21	1433	5288	12'3		10
9" "	12	50	33	268	13½	1420	3807	10'3		8
8" "	9	35	21	180	15	1413	2492	8'3		6
7" "	6½	30	17	115	9½	1525	1854	7'2		5½
7" "	4½	22	17	115	9½	1361	1477	—		—
64-pr. "	Cwt. 61	10	8	61	7	1333	897	—		—
40-pr. B.L.	32	5	—	40	lbs. os. 2 4	1180	386	—		—
20-pr. "	{ 15 } { 13 }	lbs. os. 2 8	—	20	1 3	1000	149	—		—

COMPARISON OF THE BALLISTICS AND WEIGHTS OF B.L. GUNS.

Guns.	Weight.	Charge.	Projectile	Muzzle Velocity.	Muzzle Energy.	Penetration Wrought Iron, at 1000 Yards.	Estimated Penetration, Compound Armour, at 1000 Yards.	Bursting Charge Common Shell.	Weight of Ammunition for — Rounds.	
									100	80
17' B.L.	Tons. 100	lbs. 771·8	lbs. 2005	Feet per sec 1851	Feet Tons. 46,609	Inches. 31	Inches. 24	78	Tons. 121·4	Tons. 97·1
18" „	63	880	1700	2100	52,000	32·5	25	50	115·1	91·8
13"·5 „	63	625	1250	2050	36,315	28·6	22	40	81·6	65·6

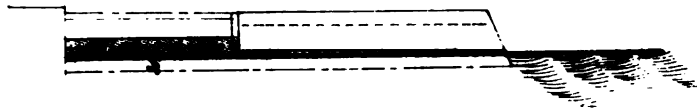
of compound armour at 1000 yards, the 25-ton gun fifteen inches, the 43-ton gun seventeen inches, and the 63-ton gun twenty-two inches, and the 100-ton gun twenty-four inches, and the Hope gun promises greater things. It is more than probable that ocean cruisers will be armed with the 43-ton or even the 63-ton gun; in fact there is no reason that guns of that weight should not be mounted in a gunboat. Oh! but say the armour-platists (or fatalists, as I call them), these penetrations are only obtained by direct hits, which will be very rare in action and gun-fire is not accurate, and the 10-inch armour will deflect all projectiles striking at oblique angles of inclination and resist all light guns and machine guns which will play dreadful havoc with your raft body, and let in water, and your ship will be sunk; therefore, we will take the chance of direct hits reaching our magazines and boilers, because, taken altogether, we consider that the odds are in favour of the belt of armour.

In reply to these views of comparative security, I feel confident that experience will show that direct hits will not be so few and far between, especially in fleet actions, and that gun-fire will be accurate enough at close quarters, which, if desired by one of the combatants, can only be avoided by a stern fight, which must prove fatal as against the armour-plated bow of the cellular-deck-protected ship. As regards machine-gun fire, a 2-inch steel outer skin of ship at the water-line round the raft body will afford sufficient protection, but the coffer-dam sides will alone facilitate the closing up of shot-holes. The numerous cells will take a great deal of riddling before buoyancy is endangered,

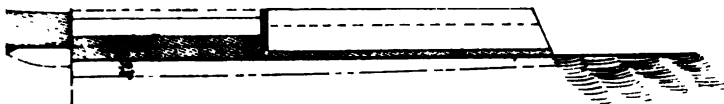
whereas shots through the 10-inch belt will defy all repair, and let water into large buoyancy spaces even if they do not cause immediate destruction by reaching the magazine or boiler. In olden times in broadside to broadside fighting with far more numerous guns at work, water-line shot-holes were plugged, and ships were seldom sunk in action, but otherwise disabled. They had no such protection as the raft body will afford, and the advocates of thin armour must remember that in those olden days ships had no boilers, and round shot and shell could not reach their magazines, whereas shells from the powerful guns now carried at sea could effect that object after passing through 10-inch armour, or create great havoc. This would be provided against by a strong covering deck. There is no doubt a charm about armour protection, but it is likely to become less favoured in the future than it has been in the past, because the demand for a high rate of speed must reduce the weight and therefore the thickness of armour a ship of moderate displacement can carry. The ram and torpedo attack militates against monster ship building, and of course the thickness of armour is limited by the size of ship and other essential requirements. The great recommendations of the cellular-deck method of protection to buoyancy are, that it economizes weight, and thus enables armour to be placed round the bow and stern to deflect raking fire, also stouter armour on the barbette towers and conning towers, and shelter screens and traverses on the battery decks, and that the protection afforded is not rendered obsolete by any increased power of gun.

Our fleet certainly displays every variety of type, as shown by Plates B. and C., which only indicates that our Admiralty have had no settled programme, and have not realized the wants of the navy of England; great mistakes have been made, but it is unfair to cast the whole blame upon the constructors, because the Naval Lords of the different Boards of Admiralty are responsible for all imperfections which have arisen from practical errors of judgment approved of during their period of office.

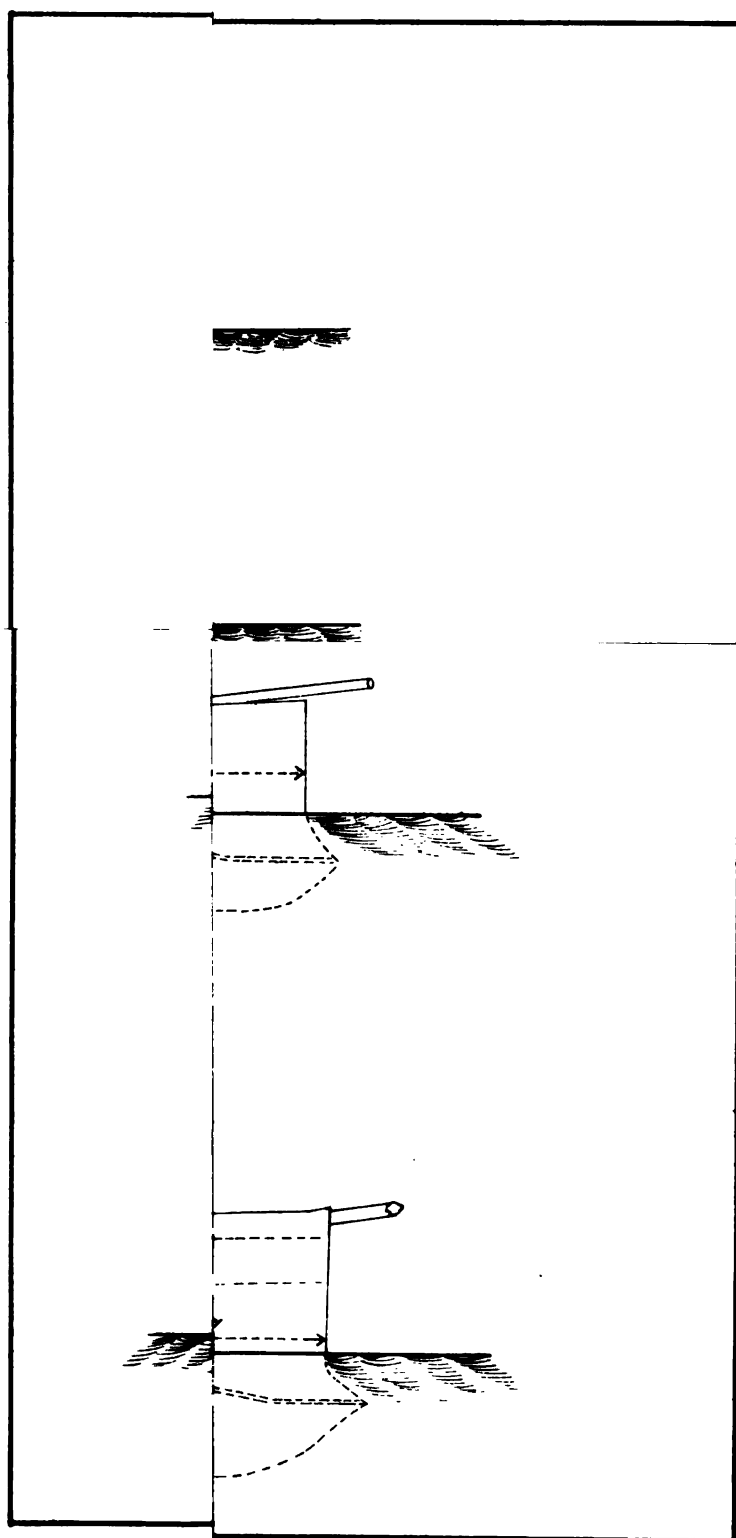




*Perwitsch*









The blunders committed by different Boards of Admiralty go far to support the impression which exists, that a wider scope of professional and scientific investigation would have insured a more enlightened policy in the ship-building department of the navy. The rapid progress of science is always brought forward as the cause of repeated changes, but as regards the strife between guns and armour, there is nothing but what might and ought to have been foreseen. With the exception of the committee on designs for ships of war in 1871, no comprehensive inquiry has been held outside the Board of Construction, and the recommendations of that committee were never carried out even as regards their urgent request that experiments should be made in order to obtain information by practical tests on different important features of design and construction. These experiments, costing only a few thousand pounds, would have prevented blunders which have wasted millions. Science will always be in a progressive state, but the direction of that progress generally casts its shadow before, and prudence and foresight will shape a right course to forestall the event. But our Building Department have never seen further than the immediate future in the matter of armour-plating and speed or torpedo defence, and even now they do not seem capable of rising to the occasion. The nation has hitherto relied almost entirely on the principle of entrusting the great and intricate question of designing ships for the navy, to the exclusive judgment and decision of existing Boards of Admiralty, and looking to the unfortunate result of this exclusive system, it is surely time to adopt a system of wider investigation and more careful supervision.

All efforts which have hitherto been made, both in and out of Parliament, to bring the highest talent of the nation to bear on the decisions of the Admiralty by committees of inquiry, assisted by practical experiments, have been met by strenuous opposition on the score of expense, and vast sums of money have thus been wasted on faulty principles of design and construction of ships of war.

The simple question of the relative value of outside armour

and cellular-deck protection, if brought to the test of actual experiment by firing at targets accurately representing these competitive methods of gun defence, would long ago have satisfied all doubts on the subject. Exhaustive experiments on different modes of torpedo defence would also have thrown light on what possibly can be done to protect the bottoms of ships from the destructive effects of this deadly weapon of offence, and surely one of our obsolete ships could not possibly have been put to a better use.

As a first step in this direction, a Royal Commission should be appointed at once, to report upon the entire question of the classification of the fleet and the designs of ships of war, and on the separate question of whether in future, some permanent committee of scientific and practical men should not be constituted to examine and report upon all designs before they are submitted for the decision of the Board of Admiralty.

I would here refer to the fact that when the question of clothing ships with outside armour first arose in consequence of the introduction of this principle by the Emperor of the French, after the Crimean war, the desirability of adopting this mode of protection against the gun attack was fully considered by the Royal Commission on National Defences; and as a member of that commission, I thought that the readiest means of arriving at a sound judgment before entering upon such a novel feature of naval architecture was by an examination of the most competent witnesses capable of deciding what was likely to be the result of the competitive contention between armour and guns. This contention seemed clearly to resolve itself into the simple question of the limit of the power of the gun of the future, and the limit of the weight of armour which ships could carry without such sacrifices of other qualities as would render its use injurious, or at least unadvisable.

On the question of the future available increase of gun-power, Sir Joseph Whitworth and Sir William Armstrong were both of opinion, that if armour-plating invited increase of gun-power, the gun to pierce the armour used would always be found ready

before the ship could be launched, provided that the money was forthcoming for the manufacture of the gun. In fact, it was simply a question of money as regards the limit of the power of the gun.

On the other side, as regards the limit of the thickness of the armour-plating a ship could carry, this question appeared to be readily solved by the amount of displacement or size of ship which could be reached without becoming actually objectionable on account of loss of other fighting qualities. It appeared, from inquiries made, that a thickness of twelve inches of iron would necessitate a ship of 10,000 tons' displacement, with 14 knots speed, and even then with armour only applied to an all-round belt and on the turrets, and that whilst on the one side, ships of these dimensions would represent an extreme limit of size for fighting in fleet actions, on the other side, the gun to penetrate at long ranges twelve inches of iron could readily be supplied. For the reasons above named, the commissioners recommended that ironclad forts in the sea should be erected at Spithead for the defences of Portsmouth, upon which thicker armour could be placed if required.

Now, I know that I shall be met with the opinion that foreign nations having commenced to build armour-clads, England was obliged to follow in their wake; as the object of this paper is especially to deal with present emergencies, I would desire to avoid finding fault with the past any more than is actually necessary to elucidate some of the causes of the unsatisfactory position in which we now stand. I am, therefore, willing to admit that some excuse may be allowed for that want of foresight which has induced this country, as a matter of expediency, to enter into the race of armour-clad ship-building in competition with other nations, notwithstanding the fact staring us in the face, that the gun would be produced capable of easily overcoming the stoutest armour that could conveniently be carried to sea. As, however, the evidence of the superiority of the gun has for some time been realized, and as the efficiency of the ram and torpedo has become more developed, I cannot admit that

there has been sufficient excuse of late years for continuing to fight a losing game, and that it would have been more creditable to our naval designers to have recognized this fact, and to have eagerly encouraged the introduction of some such substitute plan of protection for war-ships as has been proposed by those who have opposed the continued use of side-armour.

This contention is mainly based on the broad principle that the prominent part which the ram and torpedo will take in the result of fleet actions, points strongly to the desirability of limiting the size of ships which at once prohibits the use of armour of sufficient thickness to afford any reliable defence against modern artillery.

However, there has been some evidence of wavering of late, and the present demand for a much higher rate of speed than has hitherto been deemed essential, will necessarily still further limit the weight of armour which ships can carry; whilst at the same time, the increase of gun-power has rendered the dependence on outside armour less reliable than ever. Therefore, at the present crisis, it is of supreme importance that the value of the proposed substitute mode of protection should carefully be considered on its merits, and brought to the test of practical experiment. It must be borne in mind that those who advocate the disuse of weak outside armour as an obsolete and dangerous protective agency, still adhere to the use of armour plating when applied in such manner as will enable it efficiently to carry out its purpose, viz. to prevent fatal disasters or to render their occurrence less probable. As this result can no longer be obtained by armour plates placed vertically on the outside of a ship unless of great thickness, and as ships of moderate dimensions combined with great speed and coal-carrying capacity can only bear the weight of comparatively thin armour, its continued use has greatly lost its value. The ram and torpedo strongly point to the improvidence of monster ships built solely with a view to gun attack and defence, regardless of the increased exposure thus entailed to fatal injury from those other more deadly weapons of offence; opinions appear to be growing in



favour of ships of more moderate pretensions, which strengthen all the arguments in favour of the proposed substitute mode of protection.

It may be well, therefore, to state emphatically that those who propose to abandon side armour, do so because they consider that a far more efficient protection will be afforded by utilizing an equal amount of iron plating in a different manner. It must be evident to all, that a crisis has arisen in naval designing of an alarming character, owing to the general use of sea-going torpedo vessels, and to the gun having asserted a decided superiority over any possible combination of wood and iron which it is practicable for a ship of acceptable dimensions to carry in the form of an all-round belt. Hitherto outside armour has been applied with at any rate the *professed intention and expectation* of resisting penetration; but now that this object is no longer obtainable, this partial protection is still advocated on the ground that perforation is limited by distance, and direction, and nature of fire!

I would invite those who are committing the country to an expenditure of millions of money on such considerations as these, to give a practical definition of the value of such limitations. It appears to me that they are dangerously deceptive, because by no tactical skill can a combatant select to fight at long range, except by turning away from his opponent, which must eventually result in a stern fight greatly to his disadvantage. I therefore maintain that between two ships having equal speed, close action and *direct fire* cannot be avoided, and so long as penetrable armour invites the adoption of the most powerful ordnance, so long will the heaviest guns have to be encountered as a part of the armament of ships of war. If the water-line is penetrable, one projectile may decide the fate of an armour-clad, either if it reaches the magazines or boilers, or if it causes a large aperture, on entering or leaving the ship, for the admission of water into the hold. In fleet actions there can be no question about close quarters and direct hits. I agree that the "dogma of invulnerability is untenable," and I could under-

stand such a makeshift as penetrable side armour being accepted, if no more effectual security to the vitals of a ship could be attained by any other system of defence; but I hold it to be an essential element of fighting vitality, that the magazines and boilers should be rendered as invulnerable as possible. I maintain that this can be more securely effected by covering these danger-points with a deck (placed some five or six feet below water) of sufficient thickness to deflect any possible projectile, than by an outside coating of armour easily penetrable under known conditions of attack, which are certain to be selected by an opponent, and impossible to guard against.

No doubt this deck would absorb so large a portion of the weight available for protective purposes, that it involves the necessity of abandoning any outside coating of armour; thus it has been argued by the advocates of side armour that increased security to magazines and boilers by a deck covering, is only obtained at the sacrifice of a considerable amount of protection against being sunk by the inlet of water through shot-holes about the water-line, and that it is therefore only a choice between two evils. They lay great stress on this point, but they entirely omit to notice that a prominent feature of the alternative plan is the provision of safety against any dangerous inlet of water which is afforded by a cellular body of ship extending from six feet below to six feet above the water-line, and which secures a great reserve of buoyancy, and admits of a ship being extensively riddled about the water-line before any danger of sinking would arise.

N.B. The cells would probably be in dimension about twelve feet (cubes).

This feature of fighting vitality, namely, "Limitation of the admission of water," requires to be very closely examined, before coming to judgment on the respective values of the two systems; but if the verdict is made to depend upon the amount of injury which each ship promises to endure without its efficiency being seriously impaired, I consider that the advantages claimed for the armour-clad cannot be compared in point of importance

with those which promise to be obtained by the adoption of the cellular deck system.

Thin side armour may be proof against all the lighter descriptions of ordnance even at close quarters, and against the direct fire of powerful guns at very long ranges. Up to a certain point it may be proof against oblique firing from all artillery, but even in these respects there is no fatal issue involved in the adoption of the "raft body," as it may be extensively riddled without endangering the ship; while at long ranges a ship can be perfectly defended by the "end-on" position if armour-plated round the bow and stern, which is one feature of the proposed substitute plan of defence. Her object, however, will of course be "to close," and I would ask how will the question of comparative safety then stand?

The comparative danger arising from shot-holes which admit water, must be measured by the space opened out by the projectile for the admission of water at the point of penetration, and by the space opened out within the ship to contain water. If one large projectile should penetrate an armour-clad at or below the water-line, a very large aperture will be made, and a very large portion of the hold will be opened to the sea. It is difficult to imagine that such a hole could be stopped; whereas, on the other side, if a number of projectiles of equal size were to penetrate the cellular body of a ship, the aperture would be small, and the amount of water which would enter from the sea would be limited to the space contained in the number of cells perforated, and reparation of damages by various machines for stopping the flow of water through shot-holes made in thin iron plates might be continuously carried out as in days of yore, or the ship might haul off to repair damages and go at it again.

I would argue, therefore, that whilst one direct hit from guns now in use, at the water-line of an armour-clad, would probably sink her if it did not blow her up, the raft-bodied ship could not be so easily disposed of, and as regards those other perforations which the latter would have to accept and from which the armour-clad would be spared, there is no fatal issue involved as

regards the chances of being sunk. I therefore hold that the balance of safety will be greatly in favour of the ship with no side armour. The existing thin-armour deck, which is the only defensive covering to the armour belt which an armour-clad can afford to carry, is an element of vulnerability too conspicuous to be lost sight of by naval experts, in contemplating the effect of depressed fire from barbette guns at close quarters. The raft-bodied ship would naturally not waste her powder upon oblique firing; her duty would be to maintain as much as possible a bow presentation, and seek to close her armour-clad opponent, when direct hits would not be the exception. Depressed fire from monster guns would prove the fallacy of placing dependence upon a system of protection based on "limitations of distance or direction, or nature of fire."

Side-armour struck in reverse by heavy solid shot will be one of the most fatal incidents of future battles, especially when ships are rolling.

Having now considered this question of comparative invulnerability under three different heads, namely; *first*, protection to magazines, boilers, and engines; *secondly*, protection to the ship from being sunk; *thirdly*, protection to guns, I would submit as an urgent necessity, that before launching into a large expenditure of money on the new belted cruisers, experiments should be carried out to ascertain the amount of destruction which would be caused by projectiles penetrating a vessel protected by side-armour of ten inches maximum thickness at the belt, and only eight and six inches on the battery, as compared with the injury caused to a raft-bodied ship, with the same gross weight of armour protection utilized in the substitute plan proposed. The fate of magazines and boilers and weakly protected barbette towers and conning towers should at the same time be ascertained. I should not mind laying long odds on the latter plan of defence.

To advocate the continued use of side-armour on the assumption that such weapons as the 25-, 43-, 63-, and 100-ton guns "will be few and far between," in my opinion, only shows how

strong is the temptation to hang on to old expedients, rather than face the necessities of the future. Surely the experience of the past must teach us that neither the cost nor trouble of producing such guns will limit their general use, if their services are called for by the continued use of penetrable side-armour. The same thing has been said of the 12- and 18-ton guns. It is this want of foresight that has left us with an obsolete fleet which dare not even confront a few gun-boats such as I described in Chapter V., with a 43- or a 63-ton gun placed behind an impenetrable shield, as a substitute for coast defence monitors of the *Glatton* type, and for the very vulnerable and therefore inefficient class of gunboats we possess.

I consider that the possibility of converting some of the existing side-armour ships into raft-bodied ships should be carefully ascertained, selecting in the first place those with the thinnest armour, from four to six inches, such as the *Warrior*, *Minotaur*, &c. It may be possible in this manner to render these ships really formidable in a short space of time. In the present "obsolete condition" of the fleet, it is frightful to contemplate the sacrifice of life which must result from sending those ships into battle. If it be possible to afford increased protection, not a day should be lost in making a beginning. For to meet such a question as this by the argument that other nations are no better off than ourselves, is not a statesmanlike or humane view to take of the situation.

#### CLASSIFICATION OF SHIPS OF WAR.

In all times past, the navies of the world have consisted of different classes of vessels intended for special services, and each class of vessel has had its own peculiar qualifications, and credit was due to the designer, so far as he succeeded in excelling in those specialities which rendered a war-ship the most efficient of her class. War-ships have always been classed according to size or tonnage, but it so happened that before the days of steam, as their fighting power was reduced, greater speed was obtained, so that the frigate could outsail the line-of-

battle ship, and the corvette could hold her own with the frigate, and even the brig and schooner and cutter had the best of it in beating to windward.

This law of safety, which is one of common sense, has disappeared in our navy with the days of steam power and armour-plating; and speed, the only means of escaping capture, has diminished *pro rata* with the decrease of fighting power of ships; and this not of necessity, but from the tactical errors of judgment which have been displayed. This law of safety is one which the commonest prudence would point out as too important to be disregarded; yet it would appear that the naval world has lost sight of war requirements, or as if plating ships' sides had entirely produced a change in the character of naval warfare.

It is the province of the executive officers at the Board of Admiralty to provide their naval constructors with clearly-defined instructions for the classification of the fleet, and on those tactical features of design which constitute fighting efficiency, which do not come within the scope of the experience of the naval architect. For this purpose, I have always suggested the great advantage of a table of classification being provided, such as I supply herewith, showing in detail the standard of efficiency for each class of war-ship which may be required to be built, and which marks, in their numerical order of importance for each class, those special features of design wherein each class should excel as being best adapted to the services required to be rendered. (See Table B.)

The naval lords would then be held responsible for this programme, and the constructors on their part answerable for the skill displayed in carrying out these conditions to the greatest advantage.

Duties and responsibilities have been hitherto unfairly thrown upon the shoulders of the non-professional officer, who has been brought into a position of prominence with regard to matters beyond the scope of the experience of a naval architect.

TABLE B.

CLASSIFIED PROGRAMME FOR SHIPS OF WAR, WITH QUALIFICATIONS OF EACH CLASS IN THEIR NUMERICAL ORDER OF IMPORTANCE.

CLASS.			
LINE-OF-BATTLE SHIP.	1ST CLASS CRUISER.	2ND CLASS CRUISER.	3RD CLASS CRUISER
Displacement, 9000 to 10,000 tons.	Displacement, 11,000 to 12,000 tons.	Displacement, 8000 tons.	Displacement, 5000 tons.
Speed, 14 knots.	Speed, 18 knots.	Speed, 20 knots.	Speed, 20 knots.
Guns, two 100-ton.	Guns, two 63-ton.	Guns, two 43-ton.	Guns two 25-ton.
Fuel for 3000 miles at 10 knots' speed.	Fuel for 5000 miles at 10 knots' speed.	Fuel for 6000 miles at 10 knots' speed.	Fuel for 6000 miles at 10 knots' speed.
QUALIFICATIONS.			
1. Seaworthiness.	1. Seaworthiness.	1. Seaworthiness.	1. Seaworthiness.
2. Handiness.	2. Steaming.	2. Steaming.	2. Steaming.
3. Guns and Armour.	3. Guns and Armour.	3. Stowage.	3. Stowage.
4. Steaming.	4. Stowage.	4. Guns and Armour.	4. Light Draught.
5. Stowage.	5. Sailing.	5. Sailing.	5. Guns and Armour.
6. Sailing.	6. Handiness.	6. Light Draught.	6. Sailing.
7. Light Draught.	7. Light Draught.	7. Handiness.	7. Handiness.

I consider that all the services required to be rendered by the navy of England, both in times of peace and war, can be efficiently fulfilled by dividing the fleet into five distinct classes, not reckoning flotilla; namely, one class of armour-clad for fighting in line of battle, and three classes of cruisers for colonial defence and protection of commerce, and a fifth class which I designate ocean-coaling depôt ships. This latter class, which will be a most essential requirement, should be lightly armed and protected, and for safety should possess the highest rate of speed, combined with great coal-carrying capacity, and on the outbreak of war should be at once improvised from the mercantile marine, and employed as station-ships at fixed rendezvous.

The speciality of the line-of-battle ship is for fleet actions.

The speciality of the first class cruiser is for colonial defence, that of the second class for guarding the central points of trade routes, and that of the third class for wider distribution to protect the lines of commerce.

It will be seen by reference to the table of classification on the previous page, that a specified speed and coal capacity, displacement, and gun power, are made obligatory for each class, which conditions the architect has to comply with, and this necessarily will regulate the remaining weights available for armour. But I hold that it is necessary that these specified features of design should be stipulated for as being essential conditions of a well-devised system of classification. The heaviest guns are only mentioned, as the lighter guns are more a matter of detail.

The *Liner*, as proposed, is a short handy ship, with great rudder-power, of moderate displacement and limited speed, stowage, and sail power, with cellular deck water-line protection, four or five inch deck; two cone-shaped barbettes, each mounting one 100-ton gun, protected by twenty-inch armour; two conning towers, sixteen-inch armour; skin of side on battery deck two-inch, and on safety screens and traverses; bow and stern armour-plated round, and from upper deck downwards to below armoured deck, eight inch tapered; a fixed crinoline torpedo protection. (See description on page 95.)

This class is intended only for fleet actions in European waters.

The *First Class Cruiser*. The properties of this vessel as proposed differ from the liner as follows:—Greater speed and displacement, and length of hull and stowage, and sail power, but somewhat less powerfully armed and protected, and less draught of water (*see table*). I consider that it would greatly deteriorate from other essential qualities to limit draught of water for Suez Canal passage.

They are intended for colonial defence, but a small squadron of these swift, powerfully armed vessels should be attached to each line-of-battle fleet.



The *Second and Third Class Cruisers*. These vessels, intended for the protection of commerce, should possess the highest attainable speed; and for their other qualities in order of importance, see table.

1. In deciding the qualifications for each class in their numerical order of importance, I have placed sea-worthiness as No. 1 in all classes. I support that opinion, on the grounds that it is due to the crews who man the ships and have to contend against a dangerous element, that they should have perfect confidence in the safety of their ship in all weathers.

2. Then in the liner I place handiness as No. 2, because the power of turning shortly, that is, on a small arc of a circle, is an element of safety when ships have to manœuvre in compact masses, and essentially an element of superiority in ramming. I place guns and armour as No. 3, to make her the highest standard of gun attack and defence, consistent with handiness, and the largest amount of displacement which I deem to be admissible with due consideration for the occurrences to be met with in fleet actions at sea.

I place steaming No. 4, because, for purposes of fleet actions, great speed is not a prominent feature of fighting efficiency. Stowage has a low number, 5, because the line-of-battle ships are designed for European waters. Sailing properties, No. 6, have a low value, for a very moderate sail power will suffice, and light draught of water is placed last because it can only be obtained by a sacrifice of more essential qualities.

It may be found necessary to revise this table from time to time, in order to meet the changes which the progress of science may introduce, or in order to compete successfully with similar classes of ships adopted by other naval powers. But this system of classification would always tend to regulate responsibility between the practical and scientific elements of man-of-war designing, and such definite instructions on tactical points of efficiency are only what the naval architect is entitled to receive for his guidance. With a view also to bring the highest

intellect of this great maritime nation to assist in producing the most perfect ship of war of each class, our great shipbuilding yards should be invited to compete for designs on the lines indicated by the table of classification adopted, which designs should be submitted for judgment to an independent and competent tribunal of experts.

The unsatisfactory condition of our existing fleet may be mainly attributable to the neglect of Boards of Admiralty to supply the Construction Department with a classified programme for their guidance. The non-professional officers of this department have of late years been left to instruct the naval lords, instead of receiving definite instructions themselves, and thus have been placed in a false position. Yet in former days some of our best ships were designed by naval officers. It may be assumed that the voice of the nation will (it is to be hoped not *too late*) compel the Government, *nolens volens*, to greatly strengthen our defensive armaments by land and sea, and it is highly necessary that a new departure should be taken in the conduct of naval affairs. The first reform that is required, is to restore the Board of Admiralty to its former professional character and relationship with Parliament, and it is not possible to describe what should be done for the navy in terms more accurate and conclusive than those which appeared in the *Pall Mall Gazette* of the 14th March, which were summarized as follows:—

“1. That a Royal Commission should be immediately appointed to inquire into and report upon the strength of the navy, and the mode in which it is administered.

“2. That the constitution of this Commission should be as influential and representative as possible, special care being taken to secure an adequate representation of naval officers, engineers, private shipbuilders, and of our colonists.

“3. That the scope of this Commission should include the following questions under the first division: (1) What should be the normal establishment of our navy, and what relation should it bear (*a*) to the navies of other powers afloat and on

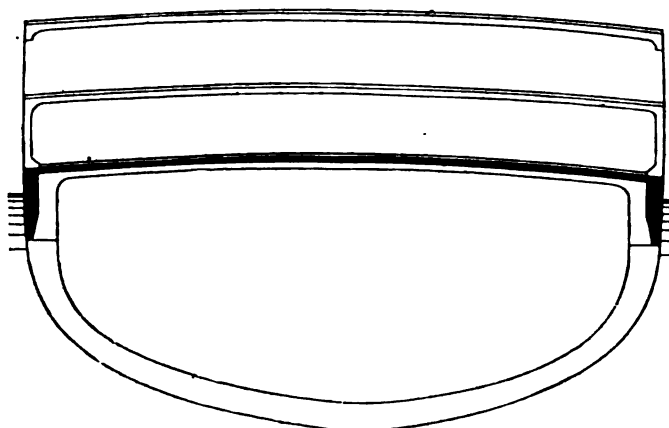
the stocks, and (*b*) to the extent of our empire, the increase of our responsibilities, the growth of our commerce, and our increasing dependence on supplies of food from over sea? (2) What should be (1) the normal programme of construction, and (2) the recognized proportion which one class of ship should bear to another?

“4. That under the second division of organization and administration there shall be included:—(1) The organization of the Board of Admiralty. (2) The repeal of Mr. Childers' Minute. (3) The extent to which decentralization is possible. (4) The infusion of a naval element in naval administration. (5) The establishment of an adequate Intelligence Department. (6) The organization of the fleet for war. (7) The creation of a consultative committee on designs, and development of competition between the Constructive Department and private shipbuilders, whether by an independent committee of advice or otherwise. (8) Dockyard administration. (9) Our system of reserve. (10) Arrangements for manning and training seamen.

“5. That among other questions on which the Commission could bring to a focus the best opinion of the country are—(1) Maritime capture. (2) The bombardment of open towns. (3) Is food contraband of war? (4) The supersession of the ironclad. (5) The distribution of armour. (6) The possibility of blockade under altered conditions. (7) Coaling facilities (*a*) in port, (*b*) at sea. (8) The protection of merchantmen by convoy or otherwise. (9) The possibility of utilizing mercantile auxiliaries. (10) The hire of transports. (11) The growth of the non-effective vote.”

While the Commission was sitting the Admiralty would feel itself on its trial, and would therefore naturally use every effort to push forward as rapidly as possible all the ships it has already in hand, and execute the programme to which it is already committed. Thus no delay would be caused, and a solid foundation provided for future action.

COLLINGWOOD



ADMIRALTY DESIGN.

PLATE XX.

ADMIRAL ELLIOT'S DESIGN, AND METHOD OF TORPEDO DEFENCE,

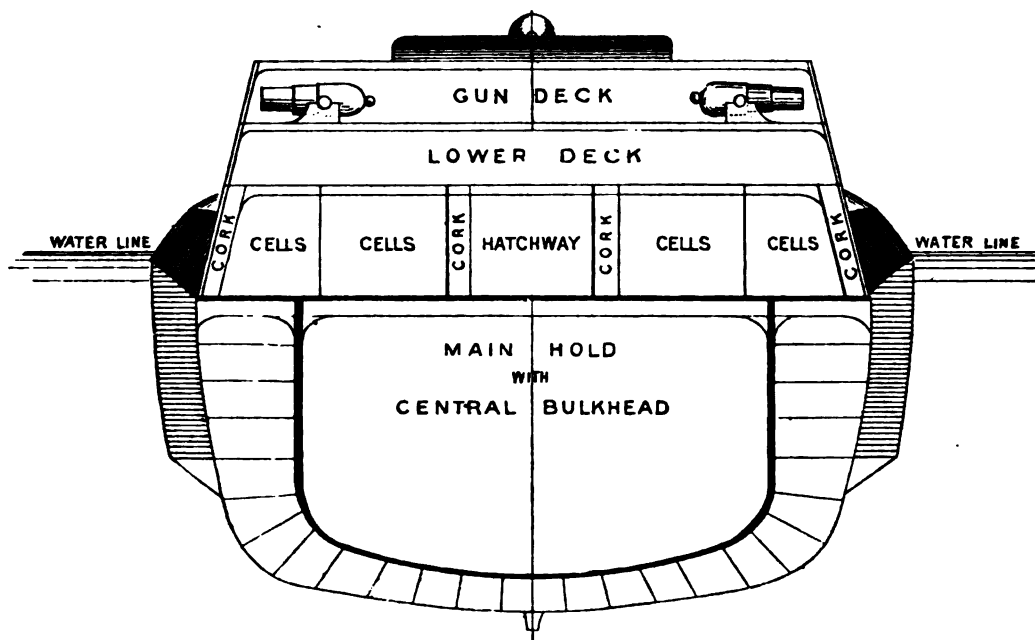


PLATE XXI.

DESCRIPTION OF SIR GEORGE ELLIOT'S DESIGN.

This fixed crinoline torpedo defence can be applied to armour-clads already built or building. Its weight would be about

twenty tons, and it would cause a loss of speed, according to the late Mr. Froude's calculations, of one-sixth of the full speed. A block or fender of wood or iron construction is fastened round the ship's side to form a recess below the water-line of five feet in depth, from which downwards for fifteen feet a fixed crinoline is fastened to the ship as follows:—Stays of two-inch steel rod are screwed into the ship's side with eyes at the end through which horizontal one-inch steel rods are rove, and then vertical half-inch rods of short lengths are fastened to the horizontal rods with nuts and screws for removal or shoring ship when docking.

It is known that a fish torpedo, exploding in contact with any enclosed floating body, exercises its greatest power of destruction, and also that a cushion of water between the bursting charge and that body is the best agent for dispersing and lessening the explosive force. Hence there is reason to believe that the proposed plan for presenting a water cushion, and deep cellular side, and stout inner skin of ship, say two inches steel, would save a ship from vital injury.

It may be said that the crinoline, such as I have proposed, would collect weeds, but as they float on the surface they could easily be removed.

The loss of speed could only be admissible for that class of ship intended for the line-of-battle, where great speed is not an element of fighting power, and all other classes having sufficient speed and sea-room can manœuvre to resist torpedo attack by gun-fire. This crinoline protection need not be worn except on the approach of war, when, if ready, it could be quickly applied. The vital importance of some greater protection for line-of-battle ships fighting together in compact masses against the attack of torpedo vessels points to the urgent necessity of causing exhaustive experiments to be made, in order to obtain practical results, which may lead to the adoption of some method of contending against these deadly weapons of offence.

As yet nothing has been done in this direction, and it may be asked, Who are responsible for this neglect? Is this also a

## CHAPTER VIII.

## THE PERSONNEL OF THE NAVY.

ALTHOUGH the previous chapters of this treatise on naval subjects have had reference almost entirely to ships and flotilla, and to their employment in naval warfare, yet the writer is not unmindful of the fact that naval supremacy will be affected as greatly by the numerical strength and efficiency of the *personnel* as by that of the *matériel* of which the fleet is composed, and that as superior seamanship will no longer possess the same advantages as heretofore, the skilful training of officers and men in the science of modern warfare, both as regards the standing navy and the reserve forces, will constitute a prominent feature of success in the strife for victory. Great efforts have been made to render our peace establishments on *active* service as perfect as possible; but when we turn to the *reserve* forces, both in point of numbers and in training, they fall very far short of what is actually required, and in this respect France is setting us an example which it is most reckless that we should treat so lightly.

It may be anticipated that future wars will break out suddenly, and be of short duration, and that the first few months will probably decide the question of the command of the seas. It is evident, therefore, that raw levies would be altogether useless for manning the fleet, at any rate until the first brunt of the war was over, and that England must rely alone on the strength and perfection of her peace establishments for successful naval warfare, and that much will depend upon the rapidity with which the respective forces can be brought into active

service. With regard to the above-named state of preparedness, the condition of our reserves is as lamentably deficient as that of the strength of our fleet of ships when compared with the available resources of the other naval powers of Europe, thus placing this country in a dangerous position of inferiority in the event of a naval war of any magnitude.

The whole question hinges upon an adequate expenditure of money, because there are no difficulties which stand in the way of providing any number of trained men which may be required to strengthen our naval reserves, beyond that of enlarging upon the recruiting system already in force by which our meagre peace establishments are at present kept up. More men of each class of reservists and more perfect training, is all that is wanted, and this premium for national insurance is trifling as compared with the serious nature of the risks which are incurred by neglecting this provision of safety.

It will be sufficient for the object I have in view if I am enabled in drawing attention to this important subject to dispose of the erroneous idea that without conscription this country cannot cope with other nations in respect of comparative numerical strength and efficiency of naval reserve forces.

In the first place, then, it may be said with much confidence that so far as meagre numbers go, the *active* service of our peace establishments of officers and men may be relied upon to maintain their traditional superiority; but it is equally certain that even for the requirements of peace our ships are considerably *under-officered and under-manned*, and that our neglect to keep up a flying squadron of instruction is a great drawback to efficient training. Moreover, that whilst about 60 per cent. of the crews of our mastless ships, and 30 per cent. of those that are masted, are non-combatants, the crews of French ships in peace time are not only one-fourth more numerous than ours, but only 5 per cent. are non-combatants, that is to say, that with the exception of that small percentage every man is subjected to be drilled to weapons of war.

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In order to expose the danger of this weakness it is only necessary to point out that had the landing-parties of our ships been sent on shore at Alexandria to protect the town from pillage, the armour-clads could not have fought their guns even at anchor, and thus the property of British subjects and foreigners was necessarily left to destruction, and their lives endangered; and also it may be remarked that in the event of war, our weakly manned squadrons abroad would have to contend at a disadvantage against the more strongly manned French or Russian ships before their crews could be strengthened.

The sooner this serious defect is remedied the better will it be for the prospect of future naval operations, because not only are our ships placed at a disadvantage all over the world in the event of a sudden outbreak of war, but by increasing our peace complements of trained men, we provide the only means by which to add to the numbers of those two most valuable portions of our reserve forces, namely the coastguard and pensioners.

With regard to our first class merchant seamen reserve, which numbers about 12,000, I believe it may be said that so largely is our mercantile marine composed of foreigners, that we have already enrolled in that class all the British seamen worth enlisting. The only means, therefore, which offers for increasing that portion of our reserves is by the establishment of training ships round our coasts for bringing up boys to be passed into the mercantile marine, and by giving such compensation to shipowners as will induce them to take these lads when trained as apprentices, who being bound to the reserve and drilled and disciplined in their youth, would be liable to be called out when required, even should they not select to continue a sea life after serving their apprenticeship. The repeal of the navigation laws was a severe blow to our naval supremacy, seeing that three-fourths of our merchant navy are now foreigners, owing us no allegiance, and likely to endanger the safety of our merchant ships in the event of war; and every apprentice sent into the mercantile marine will not only tend to restore its national character, but increase the number of seamen available for the reserves. The second

class reservists, who can be recruited in any number from our fishery population, and who are physically a fine body of men, only require to receive an adequate amount of training to become an efficient and reliable reserve force for manning the navy on the outbreak of war. This class should at once be increased to at least double its present numerical strength of 10,000 men; but it is essential to their efficiency that they should undergo at least a twelve months' experience of a man-of-war on active service in peace time to render them of any substantial service on the outbreak of war.

The policy of France has always been to drill as many seamen as possible during peace in their war ships and pass them on to the mercantile marine as a reserve, and this system even extends to their officers, of whom many are to be found in their merchant ships; an example which England should follow, it being a matter of the highest importance to create a reserve of officers of the junior ranks for the British navy, and with that object sufficient inducements should be held out to a selected number of young officers of the mercantile marine to pass through a course of training on board ships of war on active service in peace time. If it be true as reported that our drill ships are to be done away with, and that naval reserve men and officers are to be trained in batteries on shore, it becomes all the more essential that they should be given some actual experience of the discipline of a man-of-war by undergoing a short service in our sea-going fleet, a certain number being attached to each of our ships as supernumeraries, thus bringing the merchant service officers and men into closer relationship with the royal navy and with the duties they would have to perform.

The training which is now deemed sufficient for our naval reserves is far too superficial and incomplete for the requirements of modern warfare, and this want of foresight is entirely owing to the neglect of our naval administrators to call upon the legislature to sanction the necessary expenditure to enable these men to acquire that instruction in gunnery and those

habits of discipline without which their services would be of little value to the fleet on the outbreak of war.

It surely cannot be pretended that the yearly cruises of our reserve ships afford an adequate amount of training for the merchant seamen and fishermen class, who form the strength of our reserve forces, for this sort of meagre attempt at dealing with a great question can only be looked upon more as a matter of display than of any real benefit, and as one of those make-believes by which our naval supremacy is sacrificed to a spirit of false economy, and yet there is no doubt that the country would pay whatever was demanded by a firm Government if it were shown that efficiency would be secured.

What is needed, is that our naval reserve officers and men should be organized into classes, and should by instalments pass through a course of training in the fleet as supernumeraries, serving some few months in the naval barracks, to be followed by at least twelve months in a sea-going ship, which would greatly improve their efficiency when suddenly called out; and if they were placed on full pay no objection would be raised by the men.

Expenditure is of the essence of the matter, and is all that is required to render the whole personnel of the navy adequate, both as regards numbers and efficiency of training, to meet our national requirements under a voluntary system of recruiting.

It can hardly be expected that so long as Parliament is content to accept as orthodox the rose-coloured statements of non-professional authorities on the state of the navy, that the whole truth about our deficiencies will be revealed, and their latest speeches fully exemplify the disguise which is practised.

The first step towards a more healthy naval administration is to be found in purging the Admiralty department of the pernicious influence of civilian control, and restoring its original professional representative character before Parliament, for it is a convincing fact that the gradual decadence of the navy has been most conspicuous since 1871, the date of the Order in Council which deprived the Board of Admiralty of its collective

responsibility and guidance, and stultified the intention of a Royal Commission by relegating its powers to the person of the First Civil Lord.

This anomaly becomes more impressive since it is known that the views expressed in Parliament are at variance with the opinions entertained by the Naval Lords, and by the entire naval service, and that by the concealment of this fact the country is grossly deceived. The First Civil Lord exercises the entire power of a Lord High Admiral, but still wears the cloak of a representative of a Board of Commissioners before the public; but it may be asked on whose behalf does the first Secretary of the Admiralty appear before the House of Commons? Does he speak as the mouthpiece of the Board, or as the representative of the First Lord? The answer I have received to that question is "*that the Secretary represents the Board of Admiralty as represented by the First Lord.*" *Sic!*

The latest speech of the First Secretary, on introducing the navy estimates this year, is so characteristic of the optimist views which are promulgated by our non-professional administrators that it calls for special notice.

Sir Thos. Brassey's speech on the navy estimate for 1885-6, contains the following statement:—"The total personnel of the navy, including pensioners under 50, and the naval volunteers, constitutes a force of 86,000 men. The total number on the active list is 57,000, and the complements of all ships which can be made ready in twelve months is 68,000."

This statement would appear to leave a surplus of 18,000 men after manning all the ships which can be made ready this year.

It will be seen from the above, that the active list is in peace time 57,000, which taken from the total force of 86,000 gives a reserve force of 29,000 men, consisting of those now employed in our harbour ships, and the marines and coastguard and pensioner reserve under 50, and naval reserve and naval volunteers. Sir Thos. Brassey continues:—"For a war of magnitude we should require to strengthen the navy, more particularly in the

lieutenants and engineers and the engine-room complements. In the mercantile marine we have a practically inexhaustible reserve of *skilled navigators, engineers, artificers, and firemen*. The *naval reserve, more especially the second class reserve*, could be recruited to any strength required from the fisheries, the source from which the best seafaring element in the French 'Inscription Maritime' is derived."

The impression which would naturally be conveyed to the uninitiated by this report of the personnel of the British navy would be no doubt satisfactory, but it is unfortunately necessary in the cause of truth, that this highly garnished report should be exposed to the test of accurate investigation, which I shall proceed to do.

The first reduction which has to be made from this roseate description of our available resources of trained men for manning the fleet in the outbreak of war will at once more than dispose of the Secretary of the Admiralty's surplus, and that diminution arises out of the complements of ships in war time over and above the peace establishment, as I take it for granted that our ships are to be efficiently manned. Taking this increase at one-third, which is by no means beyond the requirements of modern naval warfare, the demand for 68,000 men to man the fleet will be raised to 90,000, which is 4000 in excess of the grand total of 86,000 named by Sir Thos. Brassey.

The fact of the crews of English ships being numerically weaker than those of other nations in peace time is in itself an element of danger, and it is to be hoped that this starving process is not to be perpetuated in time of war.

But there is much more to be brought forward to diminish the value of the First Secretary's estimated numbers, because, in order to realize his grand total of 86,000 men, he has swept into his net, as available for manning the fleet, every man of the coastguard and marines and pensioners and naval reserves, and even the royal naval volunteers, and at the same time denuding the whole of our naval establishments, such as barracks, and gunnery and torpedo ships, and coastguard stations, and drill and

training ships, and also ignoring the fact that numbers of trained men will be required to man the numerous merchant ships to be fitted out as cruisers; and this clean sweep is actually intended to be made of all our training establishments just when their active co-operation will be wanted for educating the raw levies of fishermen which the First Secretary has referred to as an inexhaustible means of recruiting the navy. In drawing these comparisons I have avoided all reference to our home defences, to which category the naval volunteers belong, although improperly swept into the First Secretary's grand total for manning the fleet; but another large reduction must be made from this optimist view of our manning resources in the outbreak of war on account of the absence from home of a larger portion of the first class naval reservists, some of whom may probably never reach our shores; but the First Secretary is most sanguine about the inexhaustible supply of the second class naval reservists to be obtained from our fisheries, comparing them in point of value with the French *Inscription Maritime*, and in this respect he greatly exceeds all his other exaggerations. The French *Mercantile Marine* is largely composed of officers and men who have been passed through a course of discipline and training in their *men-of-war*, and the *Inscription Maritime*, numbering 100,000! are all trained men.

Our second class naval reserve men, numbering only about 10,000! have no *man-of-war* experience, and their training in the drill ships has been most inadequate; and although their numbers could readily be increased by recruiting, yet their services would be valueless probably until the fate of the war had been decided.

Sir Thomas Brassey also omits to mention that his grand total includes 6000 *boys*, besides an equal number of young ordinary seamen between the ages of eighteen and twenty, who cannot be classed as trained men.

The moral to be drawn from this exposure of the erroneous teaching, which proceeds from the navy being misrepresented before Parliament by civilians, is that the system is an element of

danger, and that the sooner such a stumbling-block is removed the better it will be for the safety of our country, it being evident that sound and intelligent views of the state of the navy on purely professional matters can only be expected from men who have learnt by experience to master the subject—and who are unfettered by political exigencies. In this respect the army is more fortunate than the navy in having a commander-in-chief who sits in the House of Lords, and a War Office departmental staff largely composed of professional officers; and before 1871 the professional element predominated at the Board of Admiralty, and the First Sea Lord was virtually commander-in-chief of the navy, and of necessity a member of Parliament, and the office of Secretary was frequently held by a naval officer also in Parliament; but the civilianizing process has gradually obliterated these distinctive characteristics of the navy department, and the domineering spirit of political wire-pullers now reigns supreme at Whitehall, greatly to the injury of the service.

It may be asserted without fear of contradiction that no naval officer of experience, and responsible for the state of the navy, could have given utterance to such a misleading speech as that delivered by the First Secretary on the navy estimates, which, it may be remarked, was delivered off his own bat, and not as the spokesman of the professional members of his Board, whose opinions may be set aside as of no importance. It is only to be hoped that the war preparations which are now being made with some activity may be so far completed as to bring to a practical test the strength and efficiency of the personnel of the navy, even supposing that actual hostilities should be avoided, because if our whole fleet was required to be completely manned throughout in all its branches, reliable information would then be obtained by the inspecting officers of the capacity for battle of the respective crews, and thus the weak points in the training of our reserve forces would be exposed and the question of numerical weakness would be solved.

There is no doubt that England is more than a match for Russia at sea, but that is not much to boast of, as Russia is not



a first-class maritime power ; however, a little actual experience of modern naval warfare would go far to open our eyes as to the weak points in our armaments, and convince the optimists and so-called economists of the necessity for more liberal views of naval expenditure if our naval supremacy is to be restored. The reforms which are necessary for creating an efficient reserve of officers and men for the navy may be summarized as follows:—

(1) The immediate demand on the outbreak of war for lieutenants and sub-lieutenants can only be sufficiently met by a reserve of young officers from the mercantile marine, who have been qualified by actual service in the Royal naval barracks and in sea-going men-of-war.

(2) Engineer officers and firemen and artificers from the mercantile marine and engineering works of the country should be enrolled and passed through our dockyards.

(3) The coastguard and first class pensioners could only be increased by strengthening the complements of ships in peace time.

(4) The first class naval reserves could be increased by training up boys to be passed into the merchant navy as apprentices.

(5) The second class naval reserves should be largely increased and efficiently trained by a short service as supernumeraries in the Royal naval barracks and sea-going ships of war.

(6) The Royal Artillery Volunteers should be increased to 25,000 men, and officers and men trained for gun-boat and torpedo defence of our coasts.

In order to carry out these requirements, a flying squadron must be kept up and the naval estimates largely increased, and the Admiralty must be purged of civilian control ; and it is needless to say that without these reforms in the personnel of the navy, our boasted naval supremacy must continue to remain as as it now is, a delusion and a snare.

## CHAPTER IX.

CELLULAR DECK PROTECTION *versus* SIDE ARMOUR.

A VERY elaborate controversy appeared in the *Times* of April 4th and 8th of this year, between Sir Edward Reed and Mr. W. H. White, bearing on the subject above named, and as I have hitherto expressed strong opinions in favour of the cellular deck water-line mode of protection, I feel called upon to study carefully the arguments enunciated by these skilled authorities, with the object of ascertaining how far they support or controvert the views I have hitherto entertained of the respective value of these two features of gun defence in ships of war.

My first impression on reading these letters in the *Times* was one of disappointment that the point at issue between these two experts had not been more closely confined to the comparative merits of side armour *versus* cellular deck armour, but that their attention had been diverted to this feature of design only as connected with a particular type of ship—namely the *Collingwood*, which vessel is a “hybrid” or cross between the two systems of protection to buoyancy, and therefore not truly representative of either.

Mr. White’s defence of the unarmoured ends of the *Collingwood* is so far unsatisfactory that it treats of a very imperfect development of the cellular deck mode of protection, and therefore is not an exponent of the real merits of this system, and this has placed him at a great disadvantage with his skilful antagonist, who in defending the principle of an all-round belt of armour as against the mixed application of the two systems as in the *Collingwood*, takes his stand on much firmer ground, and certainly has much the best of the argument.

I am quite aware that the main point at issue between these two distinguished naval architects has been more closely confined to the question of stability than to that of floatation as displayed in the design of the *Collingwood*, and on this scientific view of the case I do not feel competent to offer any opinion except to point out that the cellular deck principle *per se* does not involve any such danger as regards stability as is produced by the top weight of a central citadel. Mr. White acknowledges that this top weight will capsize his ship if deprived of the buoyancy afforded by the unarmoured ends, and on this danger point Sir Edward Reed fixes his sharpest weapon of attack; but I am unwilling to see the question of cellular deck protection mixed up with the design of the *Collingwood*, and therefore I turn away from Mr. White's arguments to examine carefully the more direct attacks against that provision of safety to buoyancy which are to be found in Sir Edward Reed's letter to the *Times* of 8th April.

The great issue at stake is how the weights available for the protection of buoyancy and for gun defence are to be distributed to the best advantage for defensive purposes, and in order to discuss Sir Edward Reed's opinions in a concise form, I will deal with the question solely as concerning the use of side armour of less than twelve inches, beyond which limit of thickness I will for the sake of argument admit that its practical advantage still exists; and looking to the demand for increased speed and coal-carrying capacity, it does not appear probable that if combined with adequate gun protection, and if of sufficient depth, an all-round belt thicker than ten inches can be carried by any vessels of war except those of greater displacement than 7000 tons. I feel justified, however, in discussing the question on this basis, because Sir Edward Reed includes in his category of approved armoured ships our recent belted cruisers, having a narrow belt of 10-inch maximum thickness, and takes credit for having induced the Admiralty to abandon their original intention of cellular deck water-line protection in this class of war ship in favour of this thin armour belt.

The relative value of these two systems of water-line protection, namely an all-round belt *versus* a raft body, must not be ruled only by the displacement decided upon for each class of vessel, and by the power of the gun which has to be encountered, but by such tactical expedients as can be resorted to in battle, as being those best suited to the known offensive and defensive properties of the combatants.

Looking at this disputed question entirely from the point of view of an artillerist and a practical seaman, I can perceive very great tactical advantages to be obtained by the adoption of the mode of protection proposed as a substitute for obsolete armour, and I view with much regret the one-sidedness of the conclusions arrived at by the opponents of this system, and the disparaging terms in which it is sought to turn it into ridicule such as "doubtful devices and useless contrivances," &c, because they indicate prejudice and a want of matured consideration of the incidents of naval battles. I cannot also help observing that, whilst on the one side prophesying the most fatal consequences to ensue from what is called "stripping ships of armour," on the other side no admission is made of the disastrous results which must follow from placing reliance on such a delusive defensive agency as an armour plate known to be penetrable by guns certain to be encountered, and in order to support this theory we are called upon to believe that gunners will be so excited in action, or so unskilful, that in no case will they hit the large object aimed at—namely, the water-line of an adversary passing even at close quarters on their beam, but I shall refer to this feature of assumed impunity thereafter.

Sir Edward Reed's comparative remarks on the effect of shot-holes as between the two systems of defence are of the same one-sided character, notwithstanding the evidence of the fractured condition of armour plates subjected to experimental firing, and it is almost apparent that in decrying the one mode of protection, he has lost sight of the fact that a 10-inch armour plate is all that will stand between the life and death of a ship—that is to say, between one well-directed shell and the

magazines and boilers, which plate can easily be penetrated and smashed up by the guns which similar vessels will assuredly carry if invited so to do. *Vide* Plate XXIII. and Table at the end of this Chapter.

Also in referring to the baneful effects of raking fire and shell explosion on board, the assumed inferiority is misplaced because one prominent advantage of the cellular deck system is that by economizing weight at the water-line it enables the bow and stern to be armour-plated, a matter of the highest tactical importance as a defence against raking fire, which is unobtainable in a belted ship of the same displacement, at least without entailing a considerable reduction of the thickness of armour on the belt. This feature of end-on defence is not only an essential element of safety, but must prove most effective as enabling a combatant to close his adversary at an advantage, and either enforce the bow-to-bow ram encounter, or compel him to resort to a stern fight, or otherwise to pass him at such close quarters as will ensure direct hits and depressed fire at the water-line belt, and by these tactics the opportunities for riddling the raft body will be few and far between.

I may also express the opinion that for repairing damages in a raft-bodied ship at the water-line far more efficacious means can be resorted to than the ordinary shot-plugs, and that the use of cork bags for closing shot-holes in the coffer-dam sides if they are open at the top is far from being a "stupid contrivance," as it is called, considering that, as a general rule, the perforations through thin plating would not be ragged or extensive, and Sir Edward Reed's suggestion to make the outer skin of the coffer-dam of 2-inch steel plating would render machine-gun fire at the water-line harmless; but an exaggerated view has been taken of the probable effect of machine-gun fire on a coffer-dam, because the inlet of water through three or four feet of compressed cork, or some more suitable light material, would but slightly affect the buoyancy of a ship, and the same may be said, although to a lesser extent, of the damage which will be inflicted by shot and shell from quick-firing guns,

as the mode of fighting adopted by a cellular-decked ship with armour-plated bow and stern would greatly limit the opportunities for riddling the raft body. The injurious effects of shell-fire from heavier guns would, I consider, be far more fatal if the projectile exploded in passing through a 10-inch belt than if it burst at some distance in-board after penetrating the thin steel plating of a coffer-dam side. I have said that this feature of water-line protection must be governed to a great extent by tactical considerations, because skilful manœuvring will greatly influence the capabilities of gun-fire, and this view of the case is especially applicable to single actions at sea, where a clever tactician will select that mode of fighting most applicable to the offensive and defensive properties known to be possessed by his opponent, and in this respect an armour-plated bow and stern will afford enormous advantages both for attack and defence, especially if the plating is extended as high as the upper deck.

In fleet actions the ram and torpedo will require more attention than the gun attack, and that feature of battle introduces another disputed point—namely, the desirable limit of size of ship, but that question is outside the scope of the present discussion, and I shall conclude my arguments by a strong expression of opinion that as the gun power has so completely mastered the pretensions of side-armour protection, the direction in which prudence leans towards defensive properties in future designs for ships of war is that of deflection rather than of direct resistance, and that in this respect science has not reached its utmost limits of invention.

The prevailing disposition to regulate the power of the gun by the size of the vessel is, I consider, a great mistake, seeing that the additional weight of a powerful gun is not inadmissible even in such vessels as our belted cruisers, and looking to the strong inducements held out by the continued use of armour-plating even of such moderate thickness as ten inches. In those splendid steamers purchased from the mercantile marine, which are being armed with light guns only, one 25-ton gun would greatly add to their fighting power; but the cause of

this omission may probably be found in the answer to the question, where are the guns?

By way of exemplification I would here introduce an imaginary fight between one of our belted cruisers A and a vessel B, similar in all respects with the exception of a cellular deck protection at the water-line, and the surplus weight otherwise distributed. It is only fair to admit that the designer of B should be allowed to dispose of a given weight of guns and armour to the best advantage to carry out his views of fighting efficiency, and that he would therefore, if invited by a 10-inch armour belt, select as a part of his armament a powerful gun for the bow and stern, we will say a 25 or 43-ton gun. It would be most inconsistent to deny to the designer of B the right to distribute the available weight in every respect as he thinks best to complete the uniformity of his system of offence and defence consistent with such tactics of battle as will be most applicable to those features of design which he may have selected, and thus it is evident that tactical considerations should govern design and construction, and it is owing to this rule of guidance having been too much neglected that serious blunders have been committed, but we will now come to the fight.

The object of A, as it has been said, would be to riddle the raft body of his opponent with quick firing and machine guns, and thus disable him. The object of B would be to close with his opponent, and use his best endeavours to punish his water-line belt, especially where it covers the magazines and boilers, or at any rate to penetrate and flood a large compartment, for which purpose he is provided with a powerful gun at each end. The two ships thus approach each other end-on, B with his armour-plated bow steers directly for his adversary wherever he goes, and it has been suggested that A with his unprotected bow would, at a certain distance off, alter course and commence firing from the broadside; but that would be of little avail, because in a few minutes he would have to decide either to turn towards B again, or to turn right away and commence a stern running fight. It is evident that in the first case if A escapes

a bow encounter with a stronger-bowed ship, he cannot avoid passing at close quarters, and thus receiving direct hits at his belt, or depressed fire through his thin covering deck, both injuries being of a deadly nature; whereas his return fire, passing into or through a raft body, would produce no fatal results. The two combatants having once passed and exchanged broadsides, B would immediately turn round to repeat the same end-on attack, and A must naturally follow suit or else run away; and whilst the two ships are making the circle broadsides would be exchanged, but at some considerable distance, and then raking fire would once more be unavoidable, as well as close action whilst passing, if not preceded by bow ramming. If B continued this mode of fighting, no tactics would enable A to escape the danger of exposing his 10-inch belt to certain destruction, and thus receiving vital injury. My main object has been to show the immense tactical advantage of sparing weight at the water line in order to armour-plate round the bow and stern, and also the great value of a stout submerged deck protecting the vitals.

I here insert a paragraph from the *Pall Mall Gazette* which records the opinions of Captain Noble, C.B., the active director of the ordnance works at Elswick on the subject of guns and armour, which coming from so high an authority in confirmation of my arguments should have great weight with those side-armour-plating enthusiasts who still enjoy the delusive dream that an armour-plate of 10-inches thickness affords any approximate security to the vitals of a ship.

#### “SHIP ARMOUR AND THE GUN OF THE FUTURE.

“Finally, Captain Noble was invited to say what he conceived will be the character of the gun of the future. He said it was difficult to do this, as the character of the gun of the future would be influenced by the absence or presence of armour on ships of war. If ships drop armour plates altogether, there will be no occasion to increase the size of the guns; but if we



find them adding to the weight of their armour, we must have guns capable of coping with it. 'No, I don't think the rage for armour will continue. For my own part, I think an armour deck, which might be of any thickness that is necessary, would sufficiently meet the necessities of the case. I am convinced that torpedo warfare has ended the days of monster ship building, and that the demand for increased speed and a larger amount of fuel will still further limit the available thickness of outside armour, and therefore that a perfected system of cellular deck protection will become the ruling feature of future designs for ships of war, and that the objective purpose of guns of great penetrating power will cease to exist.' "

In conclusion, I wish to say that I have found myself generally in such complete agreement with the opinions lately expressed by Sir Edward Reed, and I value so highly the great efforts he has made to increase the efficiency of the navy, that I regret to have to differ with him on any one point; but as we are both aiming at the same object—namely, to produce the most perfect fighting ship of each class—I feel confident that he will not be displeased that I should have given expression to my opinions on a professional subject, which views I have advocated continuously for the last fourteen years, and which I now find to be largely entertained by my brother officers.

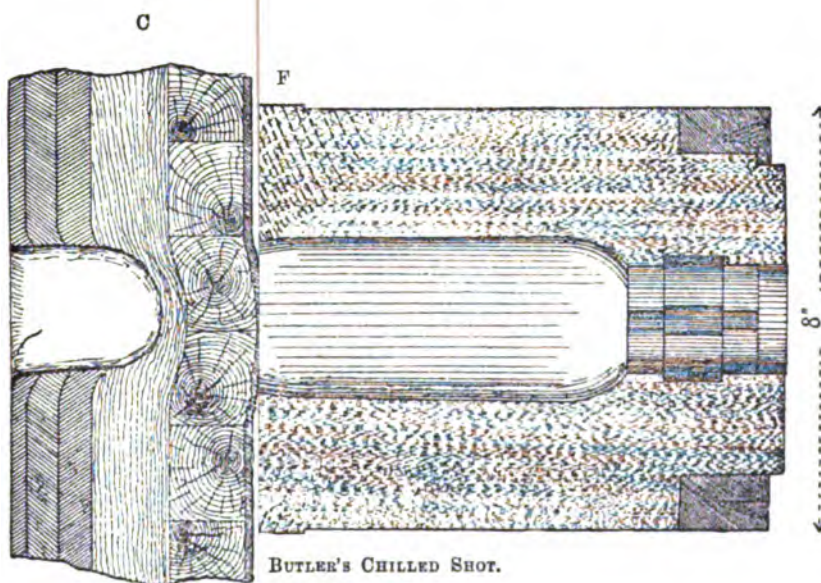
# REPORT OF THE CHIEF OF ORDNANCE.

*Record of firing with 15-inch Rodman smooth-bore gun, No. 114, at Sandy Hook, N. J., from August 22 to August 23, 1883.*  
(Gun mounted on 11-inch hydraulic carriage, altered from a 15-inch carriage.)

	Number of rounds.	Time.	POWDER.		PROJECTILE.		Elevation in degrees.	Pressure, pounds per square inch of bore.	Instrumental initial velocity, 100 feet from muzzle.	Recoil.	Wind, strength and direction.	Special remarks about each fire, such as effect on piece, sound of projectile in flight, scattering of fragments, &c.
			Kind.	Weight.	Kind.	Weight.						
A.M.; Barometer, 29.986; thermometer, 86; humidity, 68; wind, 12 miles an hour.	1	1883. Aug. 23	Du Pont's hexagonal E. V. M. Density, 1.750; granulation, 72.	lbs. ozs. 81 00	Round shot, steel (new).	lbs. 482	—10'	8000	feet. 1259	feet. 5.46	From front and right, 38°; 12 miles an hour.	Shot cracked; found 9' 4" from target. Right-hand side of target thrown back 12½" and to right 11½". Penetration, 19" 25.
P.M.; Barometer, 29.912; thermometer, 91; humidity, 66; wind, 12 miles an hour.	2	Aug. 23	Do. . . . .	81 00	Round shot, iron chilled.	453	—10'	8000	1288	5.50	From front and right, 2°; 12 miles an hour.	Shot broken into small fragments, the greater part of which remained in the target. Right-hand side of target thrown back 9½", and left-hand side 9" and entire target thrown to left 11". Penetration, 31" 25.
	8	Aug. 23	Do. . . . .	130 00	Do. . . . .	457	—15'	20,000	1635	6.25	Do. . . .	Shot passed through target and found lodged between the one-inch rear plate of target and one of the rear braces. Right side of target thrown back 2' 2", and entire target thrown 16" to right.



EFFECT OF STEEL AND CHILLED IRON SHOT ON 10-INCH ARMOUR, FIRED BY RODMAN'S SMOOTH-BORE GUN.



ROUND 1.

NOTE.—If this is the e.L. rifled-gun with a chilled shell at the same distance,  
[To face p. 122.]



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